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MMS 85-0006

DRAFT
ENVIRONMENTAL IMPACT STATEMENT
PROPOSED OIL AND GAS LEASE SALES
104 and 105
GULF OF MEXICO OCS REGION

COMPLETED 630

ORIGINAL

U.S. DEPARTMENT OF THE INTERIOR MINERALS MANAGEMENT SERVICE

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Prepared by the
MINERALS MANAGEMENT SERVICE
GULF OF MEXICO OCS REGION
MAY 1985

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I

MANAGER'S NOTE

The Environmental Impact Statement (EIS) covering the proposed OCS oil and gas lease sales in the Gulf of Mexico for 1986 is a product of the Minerals Management Service (MMS) in Metairie, Louisiana. This document discusses the purpose and background of the proposed actions, the alternatives including the proposed actions, the description of the affected environment, and the environmental impacts of proposed Central Gulf of Mexico Sale 104 (April 1986) and Western Gulf of Mexico Sale 105 (July 1986). This document will make considerable reference to the Final Regional Environmental Impact Statement (Final Regional EIS), the Final Environmental Impact Statement for the 1984 Lease Offerings (Final EIS 81/84), and the Final Environmental Impact Statement for the 1985 Lease Sales (Final EIS 94/98/102). Copies may be obtained from the MMS, Gulf of Mexico OCS Regional Office, Imperial Office Building, 3301 N. Causeway Blvd., Metairie, Louisiana or by mail from MMS, Post Office Box 7944, Metairie, Louisiana 70010.

John L. Rankin

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Minerals Management Service

COVER SHEET

Environmental Impact Statement for Proposed Central Gulf of Mexico OCS Lease Sale 104 (April 1986) and Proposed Western Gulf of Mexico OCS Lease Sale 105 (July 1986)

Draft (x) Final ( )

Type of Action:

Administrative (x) Legislative ( )

Area of Potential Impact:

Offshore Marine Environment and Coastal Counties/Parishes of Alabama, Mississippi, Louisiana and Texas

Lead Agency:

United States Department of the Interior
Minerals Management Service
Gulf of Mexico OCS Region

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Comments:

The comment period for this Draft Environmental Impact Statement closes July 5, 1985. Comments should be submitted to:

Regional Supervisor for Leasing and Environment
Minerals Management Service
Gulf of Mexico OCS Region
Post Office Box 7944
Metairie, Louisiana 70010

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SUMMARY

The Proposed Actions

Central Gulf of Mexico OCS Lease Sale 104 (April 1986) and Western Gulf of Mexico OCS Lease Sale 105 (July 1986) are considered separate proposals in accordance with the Department of the Interior's Final 5-Year OCS Oil and Gas Leasing Schedule (July 1982).

The proposed action for Sale 104 (April 1986) will offer for lease all unleased acreage in the Central Planning Area (CPA). The unleased area was 33.1 million acres on 6,167 blocks as of December 1984 (Figure I-1). However, this amount will be reduced somewhat as a net result of proposed Sale 98 (May 1985) leasing and the relinquishment of existing leases in the coming months. Unleased blocks are located from approximately 3-220 miles offshore in water depths ranging from approximately 4 m to 3,200 m. The area in Mississippi Sound formerly referred to as the "Federal enclaves" is no longer included in the CPA (Section I.B.2.c.).

The proposed action for Sale 105 (July 1986) will offer for lease all unleased acreage in the Western Planning Area (WPA) with the exception of the administratively deferred areas described below. The unleased area available for leasing was 28.2 million acres on 5,089 blocks as of February 1985 (Figure I-1). However, this amount will be reduced somewhat as a net result of proposed Sale 102 (August 1985) leasing and the relinquishment of existing leases in the coming months. Unleased blocks are located from approximately 9-222 miles offshore in water depths ranging from approximately 8 m to over 3,000 m. Deferred from Sale 105 are Blocks A-375 (East Flower Garden Bank) and A-398 (West Flower Garden Bank) in High Island Area, East Addition, South Extension and 123 blocks located in South Padre Island Area and South Padre Island Area, East Addition along the United States provisional maritime boundary with Mexico.

The biological, cultural resources, and military areas stipulations for the two planning areas are included as part of the proposed actions as mitigating measures for both Sales 104 and 105. The proposed actions are discussed as Alternative A in Sections II and IV of this EIS. The proposed sale areas and deferrals are shown in Figure I-1. Depiction of areas under lease as of October 12, 1984, are shown on Visual No. 1, Historic Leasing.

Basic assumptions, estimates, and development scenarios for impact analyses of the proposed actions are presented in Section IV.A. Four development scenarios for each proposed action provide a quantitative and locational framework for the impact analyses. The Most Likely Find Scenarios (M Scenario) are the focus of the impact analyses for the proposed sales and alternatives and are also used along with other impact producing factors in the cumulative analyses (Section IV.D.). Low, High, and Total Find Scenarios were also used in supplemental analyses for comparative purposes (Sections IV.D.1.d. and IV.D.2.d.). Table S-1 provides resource and offshore infrastructure estimates for each scenario.

Issues and Areas of Concern

To fulfill the Outer Continental Shelf Lands Act (OCSLA) and the Council on Environmental Quality (CEQ) requirements and regulations to involve others in OCS planning and decisionmaking, MMS contacted and coordinated with Federal, State, and local governments, institutions, public interest groups, and individuals during the scoping period to obtain resource information, to evaluate concerns about the proposals, and to identify environmental issues and alternatives to be analyzed in the Environmental Impact Statement (EIS). Table S-2 lists the environmental and other issues of concern chosen for analysis in this document as a result of the scoping process for Sales 104 and 105 (Section I.B.2.).

Table S-1

Resource and Offshore Infrastructure Estimates: Sales 104 and 105

	Central Planning Area - Sale 104			Western Planning Area - Sale 105		
	Scenario			Scenario		
	L	M	H	L	M	H
Acreage Available for Leasing[1] (millions of acres)	33.1	33.1	33.1	28.2	28.2	28.2
Resources Expected to be Developed[2]						
Oil (billion bbls)	0.06	0.15	0.27	0.03	0.10	0.18
Gas (tcf)	0.50	1.23	2.58	0.50	1.34	2.40
Annual Peak Production						
Oil (billion bbls)	0.007	0.018	0.032	0.004	0.012	0.022
Gas (tcf)	0.060	0.148	0.310	0.060	0.161	0.288
Offshore Infrastructure						
Exploration and Delineation Wells	140	360	700	120	320	580
Platforms (Production)	8	20	40	6	20	30
Production Wells	80	200	400	60	170	310
Pipeline (miles)	107	220	320	40	160	260

Note: Tables IV-1 through IV-5 include estimates for the Low Find (L) and High Find (H) Scenarios. These scenarios are described and analyzed in Section IV.D.1.d. (Central Gulf Sale 104) and Section IV.D.2.d. (Western Gulf Sale 105).

[1] Unleased acreage available for leasing (deferred acreage not included) as of December 1984 for Sale 104 and as of February 1985 for Sale 105. The indicated amounts will be modified as a result of the net effect of Sale 98 (CPA) and Sale 102 (WPA) and lease relinquishments.

[2] Estimates of resources expected to be discovered and produced as a result of the proposed actions. The L, M, and H Scenario values are based on the 95th percentile, mean, and 5th percentile conditional estimates, respectively, of the total unleased undiscovered economically recoverable resources in the portion of each planning area being offered under the proposed actions.

Source: USDI, Minerals Management Service, Gulf of Mexico OCS Region estimates.

Table S-2

Environmental Impact and Issues of Concern

Sensitive Coastal Habitats
  (including Wetlands Loss)
Sensitive Offshore Habitats
Water Quality
Air Quality
Endangered and Threatened Species
Marine Mammals
Coastal and Marine Birds
Commercial Fishing Industry
Offshore Marine Recreational Fishing
Major Shorefront Recreational Beaches
Cultural Resources
Tourist Activity/Industry
Military Use/Warning Areas
Water Supply
Local Employment, Income, and Population
Community Infrastructure
State and Local Land Use Management
Ports and Marine Transportation

The blocks located at the East and West Flower Garden Banks (Blocks A-375 and A-389) that are deferred from Sale 105 have been of environmental concern in recent sales and were reaffirmed during the Call for Information/Notice of Intent to Prepare an EIS stage in the prelease process. They were officially deferred from leasing in the Area Identification decision.

Historically, Central and Western Gulf OCS sales have offered deletion alternatives geared towards protecting the biologically sensitive areas near topographic highs. The commitment in Sales 104 and 105 to utilize stipulations to protect the biota of these sensitive areas makes it unnecessary to consider an alternative which would simply delete the same blocks for which the stipulations apply.

Alternatives for Central Gulf Sale 104 (April 1986) and Expected Impacts

The courses of action for this sale are as follows. A comparison of the alternatives is discussed in Section II.A.5.

Alternative A (The Proposed Action)

The proposed action is to offer for lease for oil and gas exploration and development all unleased areas (approximately 33.1 million acres) within the CPA. The proposed action is expected to result in the production of 0.15 billion bbls of oil and 1.23 tcf of gas, thus contributing towards the reduction of the Nation's dependence on foreign energy sources.

Table S-3 provides a summary of the impact levels on each resource category expected to result from the proposed action and the cumulative impact levels expected to result from the proposed action plus other impact producing factors. Definitions of the impact levels for each resource category are shown on Table S-4. The biological, cultural resources, and military area stipulations are included in the proposed action as mitigating measures.

Alternative B (Delay Action)

This alternative would withhold unleased blocks for a period of up to one year until the next scheduled Central Gulf sale, Sale 110 (April 1987). All impacts and oil and gas production expected to result from the proposed action would be delayed accordingly.

Alternative C (No Action)

This alternative equates to cancellation of the sale. Impacts and oil and gas production expected to result from the proposed action would not occur.

Alternatives for Western Gulf Sale 105 (July 1986) and Expected Impacts

The courses of action for this sale are as follows. A comparison of the alternatives is discussed in Section II.B.4.

Alternative A (The Proposed Action)

The proposed action is to offer for lease for oil and gas exploration and development all unleased areas within the WPA, with the exception of the following administratively deferred areas: Block A-375 (East Flower Garden Bank) and Block A-398 (West Flower Garden Bank) in High Island Area, East Addition, South Extension and 123 blocks located in South Padre Island Area and South Padre Island Area, East Extension along the United States provisional maritime boundary with Mexico. Approximately 28.2 million acres will be available for lease. The proposed action is expected to result in the production of 0.10 billion bbls of oil and 1.34 tcf of gas, thus contributing towards the reduction of the Nation's dependence on foreign energy sources.

Table S-3 provides a summary of the impact levels on each resource category expected to result from the proposed action and the cumulative impact levels expected to result from the proposed action plus all other impact producing factors. Definitions of the impact levels for each resource category are shown on Table S-4. The biological, cultural resources, and military areas stipulations are included in the proposed action as mitigating measures.

Alternative B (Delay Action)

This alternative would withhold unleased blocks for a period up to one year until the next Western Gulf sale is held. All impacts and oil and gas production expected to result from the proposed action would be delayed accordingly.

Alternative C (No Action)

This alternative equates to cancellation of the sale. Impacts and oil and gas production expected to result from the proposed action would not occur.

Table S-3

Summary and Comparison of Potential Impact Levels[1] from Alternatives A-D and the Cumulative Analyses

Resource Category	Central Gulf Sale 104 (April 1986) Alt. A[2]	Central Gulf Sale 104 (April 1986) Alt. B[3]	Central Gulf Sale 104 (April 1986) Alt. C[4]	Central Gulf Sale 104 (April 1986) Cumulative[5]	Western Gulf Sale 105 (July 1986) Alt. A[2]	Western Gulf Sale 105 (July 1986) Alt. B[3]	Western Gulf Sale 105 (July 1986) Alt. C[4]	Western Gulf Sale 105 (July 1986) Cumulative[5]
1. Sensitive Coastal Habitats (wetlands)	*H	*H	NE	VH	*L	*L	NE	*H
2. Sensitive Offshore Habitats[6]	VL	VL	NE	H	VL	VL	NE	H
3. Water Quality								
a. Offshore	L	L	NE	VH	L	L	NE	VH
b. Onshore	L	L	NE	VH	L	L	NE	VH
4. Air Quality	*M	*M	NE	M	*M	*M	NE	M
5. Endangered/Threatened Species:								
a. Sea Turtles	VL	VL	NE	H	VL	VL	NE	H
b. Brown Pelicans	VL	VL	NE	M	VL	VL	NE	H
6. Marine Mammals	VL	VL	NE	L	VL	VL	NE	L
7. Coastal and Marine Birds	L	L	NE	M	VL	VL	NE	M
8. Commercial Fishing Industry	M	M	NE	H	M	M	NE	H
9. Offshore Marine Recreational Fishing	VL	VL	NE	*VH	VL	L	NE	M
10. Major Shorefront Recreational Beaches	L	L	NE	M	L	L	NE	H
11. Cultural Resources[6]								
a. Historic	M	M	NE	VH	M	M	NE	VH
b. Prehistoric	M	M	NE	VH	M	M	NE	VH
12. Tourist Activity/Industry	VL	VL	NE	*VH	VL	VL	NE	*VH
13. Military Use/Warning Areas[6]	*H	*H	NE	*H	*H	*H	NE	*H
14. Water Supply	VL	VL	NE	H	L	L	NE	VH
15. Local Employment, Income, and Population	VL	VL	NE	L	VL	VL	NE	L
16. Community Infrastructure	VL	VL	NE	*M	VL	VL	NE	*H
17. State and Local Land Use Management	VL	VL	NE	L	VL	VL	NE	L
18. Ports and Marine Transportation	*M	*M	NE	*VH	*M	*M	NE	*H

VH - Very High
H - High
M - Moderate

L - Low
VL - Very Low
NE - No Effect

---

[1] Definitions of impact levels are provided on Table S-4. The impact levels are the results of analyses located in Section IV.D.1.

[2] The Proposed Action.

[3] Delay Action.

[4] No Action.

[5] Cumulative impacts of proposed action plus all other impact producing factors.

[6] The biological, cultural resources, and military area stipulations are included as part of the proposed action.

* Where the expected level of impact varies by geographic area, only the highest estimated level of impact is shown in this table. See detailed analysis in Section IV.D. for more information on the level of expected impact for other analysis subareas.

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Table S-4

Definitions Assumed in Impact Assessment

	Very High	High	Moderate	Low	Very Low
Sensitive Coastal Habitats (Wetlands)	Very severe long-term adverse effects: more than 2% of the habitat area destroyed or damaged; or loss/interference due to oil spill contacts with mangroves (2 or more), other wetlands (4 or more), or seagrasses (8 or more).	Major long-term adverse effects: 1%-2% of the habitat area destroyed or damaged; or loss/interference due to oil spill contacts with mangroves (1), other wetlands (2-3), or seagrasses (4-7).	Moderate adverse effects: 0.25%-1% of the habitat area destroyed or damaged; or loss/interference due to oil spill contacts with other wetlands (1) or seagrasses (2-3) and no spill contacts with mangroves.	Minor adverse effects: 0.02%-0.25% of the habitat area destroyed or damaged; or loss/interference due to oil spill contacts with seagrasses (1) and no spill contacts with mangroves or other wetlands.	Negligible to minor effects: 0.02% or less of the habitat area destroyed or damaged; and no spill contacts with seagrasses, mangroves, or other wetlands.
Sensitive Offshore Habitats	A species, population, community, or assemblage will be harmed to the the extent that recovery of that particular entity may not occur.	A significant interference with ecological relationships. This usually involves the mortality or a biological alteration of a noticeable segment of the population, community, or assemblage.	A short-term interference with ecological relationships. Although some species may sustain substantial losses, other species will sustain low losses, and the ecological mix will not be altered.	A few species may sustain low losses, but any interference with ecological relationships will not be evident.	Loss of a few individuals but no interference with ecological relationships.
Water Quality	Water quality parameters change significantly by several orders of magnitude; toxic trace metals or hydrocarbons exceed USEPA safe levels; changes persist for months or longer.	Water quality parameters change significantly one or two orders of magnitude; toxic trace metals or hydrocarbons near USEPA safe levels; changes persist for days to weeks.	Statistically significant changes in water quality parameters which persist for several weeks.	Some measures of water quality deviate significantly from ambient measures but are quickly (within 1-2 days) restored to normal.	Normal measures of water quality such as oxygen content, salinity, temperature, transmittance, trace metal concentrations, and hydrocarbon levels show no statistically significant changes from ambient conditions.
Air Quality	Offshore or onshore sources significantly increase levels of criteria pollutants such that nonattainment areas will be degraded further or attainment and PSD areas are significantly degraded.* Significant effects on public health and welfare are expected.	Offshore or onshore sources increase levels of criteria pollutants such that nonattainment areas are likely to be degraded to a small extent or attainment and PSD areas are likely to degrade.* Likely to pose hazards to public health and welfare.	Offshore or onshore sources increase levels of criteria pollutants such that nonattainment areas are not likely to be degraded further and attainment and PSD areas are not likely to degrade significantly.* Unlikely to pose hazards to public health and to public health and welfare.	Offshore or onshore sources increase levels of criteria pollutants such that nonattainment areas are very unlikely to be degraded further and attainment and PSD areas are likely to undergo only very small increases in levels of criteria pollutants.* Very unlikely to pose hazards welfare.	Offshore or onshore sources increase levels of criteria pollutants such that nonattainment areas will not be degraded further and attainment and PSD areas are likely to undergo negligible increases in levels of criteria pollutants.* Does not pose any hazard to public health and welfare.
Endangered and Threatened Species	A species or regional population declines in abundance (greater than 5%) or distribution, and recruitment would not replace lost individuals for at least one generation.**	A species or regional population temporarily declines in abundance (less than or equal to 5%) or distribution, or its recruitment is affected. Recovery would require at least two breeding cycles*** but less than one generation.	A species or regional population temporarily declines in abundance (less than or equal to 1%). Its distribution is minimally altered or its recruitment is marginally affected. Recovery occurs in one breeding cycle.	A limited portion of a species' regional population experiences sublethal effects, resulting in changes in distribution which last for less than one year.	A limited portion of a species population experiences sublethal effects. Changes in distribution slight but enough to initiate the consultation process.

Table S-4. Definitions Assumed in Impact Assessment (continued)

	Very High	High	Moderate	Low	Very Low
Marine Mammals (including nonendangered cetaceans)	A species or regional population declines in abundance or distribution, and recruitment would not replace lost individuals for two generations.**	A species or regional population declines in abundance or distribution, and recruitment would not replace lost individuals for one generation.**	A species or regional population temporarily declines in abundance or distribution, or its recruitment is affected. Recovery would require more than one, but less than two breeding cycles.***	A species or regional population temporarily declines in abundance; its distribution is altered minimally; or its recruitment is marginally affected. Recovery would require less than one breeding cycle.***	A limited portion of a species or regional population experiences sublethal effects that may result in changes in distribution which last for less than one year.
Coastal and Marine Birds	A species or regional population declines in abundance or distribution, or its recruitment is affected. Recovery would require more than two generations.**	A species or regional population declines in abundance or distribution, or its recruitment is affected. Recovery would require at least two generations.**	A species or regional population temporarily declines in abundance or distribution, or its recruitment is affected. Recovery would require more than one, but less than two generations.**	A species or regional population temporarily declines in abundance; its distribution is altered minimally; or its recruitment is affected. Recovery would require less than one generation.**	A limited portion of a species or regional population experiences sublethal effects that may result in changes in distribution which last for less than one year.
Commercial Fishing Industry	An economic loss of greater than 5% to the commercial fishing industry, many fishermen out of work, and secondary employment (processing plants, etc.) substantially affected.	A 1%-5% economic loss to the commercial fishing industry, some fishermen out of work, and secondary employment affected.	A 0.01%-0.1% economic loss to the commercial fishing industry, some financial loss to fishermen, and secondary employment affected.	A 0.01%-0.1% economic loss to the commercial fishing industry, some fishermen affected, but no effect on secondary employment.	A 0.01% or less economic loss to the commercial fishing industry, and a few fishermen affected.
Offshore Marine Recreational Fishing	Over 80% of the offshore recreational effort in the planning area will be affected by platform development or oil spills for an extended period of time (more than one year).	From 40%-80% of the offshore recreational fishing in the planning area will be affected by platform development or oil spills for an extended period of time (more than one year).	From 10%-40% of the offshore recreational fishing effort in the planning area will be affected by platform development or oil spills for an extended period of time (more than one year).	Less than 10% of the offshore recreational fishing effort in the planning area will be affected by platform development or oil spills for an extended period of time (more than one year).	Marine recreational fishing effort anywhere in the planning area will be affected by platform development, oil spills, or other developmental/operational aspects resulting from the lease sale.
Major Shorefront Recreational Beaches	The overall quantity of major recreational beaches in the region will permanently change and/or a persistent change in the quality of a majority of the major beaches will be evident. Sustained regional influence on the beaches or beach-related recreational activities is expected to cause beach administrative and maintenance costs to increase significantly throughout the region.	The quality of a small percentage (those associated with at least one community) of major recreational beaches in the region will be permanently affected. Sustained influence (one or more years) on the type and intensity of beach-related recreational activities is expected to influence regional and subregional displacement of recreational use. Sustained pollution or contamination of beaches causes persistent and significant increases in beach maintenance and administrative costs on a subregional basis.	The quality of a large percentage (more than one community or political subdivision) of the major recreational beach environment is minimal yet perceivably affected in a sustained manner, yet the level and type of recreational activity is not changed. Acute, short-term damage to individual beaches can occur. Beach administrative and maintenance costs will increase significantly on a short-term basis (less than one year) subregionally.	The quantity or quality of the major recreational beach environment does not change in a perceptible or sustained manner either regionally or subregionally; acute, short-term damage to individual recreational beaches is slight; the influence on one or more beach-related recreational activities is not major; and increases in beach administrative and maintenance costs are short-term and localized.	The quantity or quality of major recreational beaches does not change; short-term damage to individual recreational beaches is negligible. Impacts do not preclude recreational use although they may cause minor inconveniences to local users or site administrators. Beach administrative and maintenance costs are unaffected from the base case.

Table S-4. Definitions Assumed in Impact Assessment (continued)

	Very High	High	Moderate	Low	Very Low
Cultural Resources	An interaction between an archaeological site and an impact producing factor occurs and results in the loss of unique archaeological information.	An interaction between an archaeological site and an impact producing factor occurs and results in the loss of presently unique archaeological information; however, other sites containing similar information are likely to exist.	An interaction between an archaeological site and an impact producing factor occurs and results in the loss of archaeological data that are not unique.	An interaction between an archaeological site and an impact producing factor occurs, but impacts are temporary and reversible.	No interaction between an impact producing factor and an archaeological site occurs.
Tourist Activity/Industry	The net effect of a change in tourism expenditures within an area is considered very high if it exceeds 20% of the area's tourism expenditures expected without the proposed action.	The net effect is considered high if it represents 16%-20%, inclusive, of the tourism expenditures expected without the proposed action.	The net effect is considered moderate if it represents 11%-15%, inclusive, of the tourism expenditures expected without the proposed action.	The net effect is considered low if it represents 6%-10%, inclusive, of the tourism expenditures expected without the proposed action.	The net effect is considered very low if it represents 5% or less of the tourism expenditures expected without the proposed action.
Military Use/Warning Areas	Department of Defense (DOD) areas would have to be completely shifted, curtailed, or eliminated. Extensive alterations or reductions to military operations would be required.	DOD areas would have to be somewhat shifted or reduced. Significant alterations or reductions to military operations would be required.	DOD areas would have to be shifted or reduced slightly. Moderate alterations or reductions to military operations would be required.	DOD areas would have minimal overlap with resource development areas. Almost no alterations or reductions to military operations would be required.	No alterations or reductions of military operations would be required.
Water Supply	Regional water supply substantially affected requiring facility construction, facility expansion, or a new source of water.	Water supply in several areas substantially affected requiring modifications of existing facilities.	Water supply in one area noticeably affected stressing existing facilities.	Minor stress on local water supply.	No noticeable effect on water supply.
Local Employment, Income, and Population	10% or greater annual growth in employment/payroll/population.	7%-9% annual growth in employment/payroll/population.	4%-6% annual growth in employment/payroll/population.	2%-3% annual growth in employment/payroll/population.	1% or less annual growth in employment/payroll/population.
Community Infrastructure	Potentially major long-term adverse effects on community services and facilities: indicated by a 10% or more average annual growth rate in the population of the potentially affected area.	Potentially significant adverse effects on community services and facilities: indicated by a 3%-9.9% average annual growth rate in the population of the potentially affected area.	Potentially moderate adverse effects on community services and facilities: indicated by a 1.5%-2.9% average annual growth rate in the population of the potentially affected area.	Minor adverse effects on community services and facilities: indicated by a 0.5%-1.4% average annual growth rate in the population of the potentially affected area.	Negligible to minor adverse effects on community services and facilities: indicated by a less than 0.5% average annual growth rate in the population of the potentially affected area.

Table S-4. Definitions Assumed in Impact Assessment (continued)

	Very High	High	Moderate	Low	Very Low
State and Local Land Use Management	OCS offshore and onshore activities/facilities cannot be designed, located, constructed, and operated in any manner that would not result in a significant conflict with CZM policies and implementing provisions, land use plans, and development regulations. Facility not permitted and/or CZM consistency denied. Federal mediation procedures necessary.	OCS offshore and onshore activities/facilities cannot be designed, located, constructed, and operated in a manner that would entirely avoid or mitigate major adverse impacts on CZM policies and implementing provisions, land use plans, and development regulations. Facility not permitted and/or CZM consistency denied. Federal mediation procedures necessary.	OCS offshore and onshore activities/facilities can be designed, located, constructed, and operated in a generally compatible but less than ideal manner, i.e., moderate incompatibilities and potential adverse impacts with respect to one or more CZM policies and implementing provisions, land use plans, and development regulations would be likely. Many additional mitigation measures and/or project changes would be necessary to resolve conflicts and gain approval.	OCS offshore and onshore activities/facilities can be designed, located, constructed, and operated in a manner that is compatible, but not without some potential minor adverse impacts to one or more CZM policies and implementing provisions, land use plans, and development regulations. A few additional mitigation measures and/or minor project changes would be necessary for approval.	OCS offshore and onshore activities/facilities can be designed, located, constructed, and operated with negligible to minor incompatibilities or potential adverse impacts to CZM policies and implementing provisions, land use plans, and development regulations. Very few additional mitigation measures and/or minor project changes would be necessary for approval.
Ports and Marine Transportation	Traffic is expected to increase by more than 25%. Additional docks, berths, and facilities will be required beyond the expansion capabilities of existing ports. Traffic congestion and increased accidents will necessitate significant changes in existing traffic patterns.	Traffic is expected to increase by 15%-25%. Additional docks, berths, and facilities will be required. There may be traffic congestion problems in and near harbor access channels, increasing the likelihood of accidents and necessitating some changes in traffic patterns.	Traffic is expected to increase by 5%-15%. Some new facilities may be required, but major expansion or renovation should not be necessary. Traffic congestion and the likelihood of accidents will increase, but no changes in traffic patterns should be necessary.	Traffic is expected to increase by 1%-5%. Minor expansion of existing facilities may be required, and there may be a slight increase in traffic congestion.	Traffic is expected to increase by less than 1%. No expansion of existing facilities will be necessary, and traffic congestion should not noticeably increase.

*Note that levels of degradation of PSD areas are relative to whether they are a Class I, Class II, or Class III area; i.e., very small changes in pollutant levels are considered significant for Class I areas. (Refer to Tables IV-39, IV-40, and IV-41 of the Final Regional EIS for significance levels relative to the above definition and PSD areas.)

**A generation is the term of years accepted as the average period between the birth of the parents and the birth of their offspring.

***A breeding cycle is the average period of time between the births of successive offspring.

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ABBREVIATIONS AND ACRONYMS

ACAA	Alabama Coastal Area Act of 1976
ACAMP	Alabama Coastal Area Management Program
ACMI	Air Combat Maneuvering Instrumentation
AEC	Atomic Energy Commission
AEMA	Alabama Environmental Management Act
AFB	Air Force Base
AI	Area Identification
APD	Application for Permit to Drill
API	American Petroleum Institute
APR	areas for preservation and restoration
ARTC	Armament Research and Test Center
BAST	Best Available and Safest Technology
bbls	barrels
BLM	Bureau of Land Management
BOD	biological oxygen demand
BMR	Bureau of Marine Resources
B.P.	before present
CAA	Central Analysis Area
CCA	Central Coastal Area
CEIP	Coastal Energy Impact Program
CEQ	Council on Environmental Quality
CER	categorical exclusion review
CERCLA	Comprehensive Environmental Compensation and Liability Act
CFR	Code of Federal Regulations
CGA	Clean Gulf Associates
CMP	coastal management program
COE	Corps of Engineers
COG	Councils of Government
COPRDM	Committee on Ocean Pollution Research, Development, and Monitoring
COTP/MSO	Captain-of-the-Port/Marine Safety Office
CPA	Central Planning Area
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
DECA	Department of Economic and Community Affairs
DEM	Department of Environmental Management
DM	Departmental Manual
DMA	Defense Mapping Agency
DOC	Department of Commerce
DOCD	Development Operations Coordination Document
DOD	Department of Defense
DOE	Department of Energy
DOI (also: USDI)	Department of the Interior
EA	environmental assessment
EEZ	Exclusive Economic Zone
EFGB	East Flower Garden Bank
EIS	environmental impact statement
EPA	Eastern Planning Area
ER	Environmental Report
ERG	Energy Resources Group
ESI	Environmental Sensitivity Index
FAA	Federal Aviation Administration

FCMA	Fishery Conservation and Management Act of 1976
F.I.R.E.	finance, insurance, and real estate
FMP	Fishery Management Plan
FR	Federal Register
FWPCA	Federal Water Pollution Control Act
FWS	Fish and Wildlife Service
FY	fiscal year
G&G	geological and geophysical
GAPC	Geographic Areas of Particular Concern
GIS	Geographic Information System
GIWW	Gulf Intracoastal Waterway
HAPC	Habitat Area of Particular Concern
IMCO	Intergovernmental Maritime Consultative Organization
IPF	impact producing factor
ITL	Information to Lessees
km	kilometer
LCRP	Louisiana Coastal Resources Program
LOOP	Louisiana Offshore Oil Port, Inc.
LUMCON	Louisiana Universities Marine Consortium
m	meter
MAFLA	Mississippi, Alabama, Florida
MCP	Mississippi Coastal Program
mi	mile
MIRG	Marine Industry Research Group
MMB	million barrels
MMS	Minerals Management Service
MODU	mobile offshore drilling unit
MOU	Memorandum of Understanding
NAAQS	National Ambient Air Quality Standards
NAS	National Academy of Sciences
NASA	National Aeronautics & Space Administration
NCP	National Contingency Plan
NCSC	Naval Command System Center
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
nmi	nautical mile
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent to Prepare an EIS
NOIA	National Ocean Industries Association
NOS	National Ocean Survey
NPDES	National Pollution and Discharge Elimination System
NPS	National Park Service
NRT	National Response Team
NTL	Notice to Lessees
OCDM	Offshore Coastal Dispersion Model
OCRM	Office of Ocean and Coastal Resource Management
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
OEI	Offshore Ecology Investigation
ORCA	Office of Ocean Resources Coordination and Assessment
ORD	Office of the Regional Director
OSC	On-Scene Coordinator
OSRA	Oil Spill Risk Analysis
OTEC	Ocean Thermal Energy Conversion

OWOCRS	Open Water Oil Containment and Recovery System
P.L.	Public Law
ppb	parts per billion
ppm	parts per million
PSD	Prevention of Significant Deterioration
RAG	Resource Appraisal Group
RCRA	Resource Conservation and Recovery Act
RPC	Regional Planning Council
RPI	Resource Planning Institute, Inc.
RRT	Regional Response Team
RTWG	Regional Technical Working Group
SEL	Site Evaluation List
SIC	Standard Industrial Classification
SKIM	Spill Equipment Inventory System
SMA	Special Management Area
SMSA	Standard Metropolitan Statistical Area
SPRP	Strategic Petroleum Reserve Program
tcf	trillion cubic feet
TDS	total dissolved solids
TSP	total suspended particulates
USAF	U.S. Air Force
U.S.C.	United States Code
USCG	U.S. Coast Guard
USDC	U.S. Department of Commerce
USDI (also: DOI)	U.S. Department of the Interior
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
VCAPCD	Ventura County (California) Air Pollution Control District
VOC	volatile organic compounds
WAA	Western Analysis Area
WCA	Western Coastal Area
WPA	Western Planning Area
WSF	water soluble fraction

PURPOSE AND BACKGROUND OF THE PROPOSED ACTIONS I

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SECTION I

PURPOSE AND BACKGROUND OF THE PROPOSED ACTIONS

I. PURPOSE AND BACKGROUND OF THE PROPOSED ACTIONS

A. PURPOSE AND NEED

Purpose

The purpose of the proposed actions presented in this Draft EIS is the offering for lease of Outer Continental Shelf (OCS) areas containing potential oil and gas resources in order to increase domestic production of these resources and thereby lower this Nation's dependence on foreign imports.

The proposed action for Sale 104 (April 1986) will offer for lease all unleased acreage in the Central Planning Area (CPA). The unleased area was 33.1 million acres on 6,167 blocks as of December 1984 (Figure I-1). However, this amount will be reduced somewhat as a net result of proposed Sale 98 (May 1985) leasing and the relinquishment of existing leases in the coming months. Unleased blocks are located from approximately 3-220 miles offshore in water depths ranging from approximately 4 m to 3,200 m. The area in Mississippi Sound formerly referred to as the "Federal enclaves" is no longer included in the CPA (Section I.B.2.c.).

The proposed action for Sale 105 (July 1986) will offer for lease all unleased acreage in the Western Planning Area (WPA) with the exception of the administratively deferred areas described below. The unleased area available for leasing was 28.2 million acres on 5,089 blocks as of February 1985 (Figure I-1). However, this amount will be reduced somewhat as a net result of proposed Sale 102 (August 1985) leasing and the relinquishment of existing leases in the coming months. Unleased blocks are located from approximately 9-222 miles offshore in water depths ranging from approximately 8 m to over 3,000 m. Deferred from Sale 105 are Blocks A-375 (East Flower Garden Bank) and A-398 (West Flower Garden Bank) in High Island Area, East Addition, South Extension and 123 blocks located in South Padre Island Area and South Padre Island Area, East Addition along the United States maritime boundary with Mexico.

The biological, cultural resources, and military areas stipulations for the two planning areas are included as part of the proposed actions as mitigating measures for both Sales 104 and 105. The proposed actions are discussed as Alternative A in Sections II and IV of this EIS. The proposed sale areas and deferrals are shown in Figure I-1. Depiction of areas under lease as of October 12, 1984, are shown on Visual No. 1, Historic Leasing.

Basic assumptions, estimates, and development scenarios for impact analyses of the proposed actions are presented in Section IV.A. Four development scenarios for each proposed action provide a quantitative and locational framework for the impact analyses. The Most Likely Find Scenarios (M Scenario) are the focus of the impact analyses for the proposed sales, and alternatives are also used along with other impact producing factors in the cumulative analysis (Section IV.D.). Low, High, and Total Find Scenarios were also used in supplemental analyses for comparative purposes (Sections IV.D.1.d. and IV.D.2.d.). Table S-1 provides resource and offshore infrastructure estimates for each scenario.

Need

Current U.S. energy demands are met primarily by domestic and foreign fossil fuel. Since the Arab oil embargo of 1973-1974 and the Iranian revolution in 1978-1979, it has become increasingly apparent that our Nation must become less dependent on foreign imports and lessen our vulnerability to supply interruptions. In 1978, Congress and the President mandated the Department of the Interior (DOI) to engage in "expedited exploration and development of" the OCS in order to "assure national security, reduce dependence on foreign sources, and maintain a favorable balance of payments in world trade." A discussion of the estimated amount of resources expected to be produced as a result of the proposed actions is presented in Section IV.A.

Oil and gas leasing on the OCS is administered by DOI under the auspices of the Outer Continental Shelf Lands Act (OCSLA), as amended. The Act mandates the orderly development of OCS resources. In response to this requirement, the Secretary of the Interior submits a 5-year lease schedule to the Congress, the Attorney General, and the governors of any affected state. A major objective of the OCS leasing program is to develop needed mineral resources in an environmentally acceptable manner.

This document was prepared in response to the Council on Environmental Quality's (CEQ) regulations requiring the preparation of an EIS prior to any major Federal action which could have significant effects on the environment. Frequent reference is made to the Final Regional EIS for Gulf of Mexico OCS Sales 72 (May 1983), 74 (August 1983), and 79 (January 1984) (USDI, MMS, 1983a), the Final EIS for the Central and Western Gulf of Mexico Lease Offerings for 1984 (Final EIS 81/84) (USDI, MMS, 1983b), and the recently published Final EIS for Gulf of Mexico OCS Sales 94 (November 1985), 98 (May 1985), and 102 (August 1985) (USDI, MMS, 1984a).

Each planning area in the Gulf is divided along the 900 m depth contour line into two lease term areas. Blocks on the shoreward side of the line are leased for 5 years and blocks on the seaward side are leased for 10 years. The 10-year lease term allows industry more flexibility in meeting the technical challenges of operating in deepwater. The 5-year/10-year lease term line is shown on Figure I-2. A new stipulation has been developed for an 8-year lease term between 400 m and 900 m water depth dependent upon timing of exploration activities. This stipulation has been added to the Final Sale Notice for Sale 98 (Appendix F).

B. BACKGROUND OF THE PROPOSED ACTIONS

1. Administrative Events Leading to the Proposed Actions

The Call for Information for the two 1986 lease sales was published in the Federal Register on Friday, June 15, 1984. Requests for environmental/resource information were sent to Federal, State, and local government agencies on August 30, 1984. Requests for scoping information were sent to the public; environmental groups; Federal, State, and local government agencies; and industry on October 17, 1984. A history of the development of the areawide leasing concept is detailed in the Final Regional EIS, Section I.B.1.

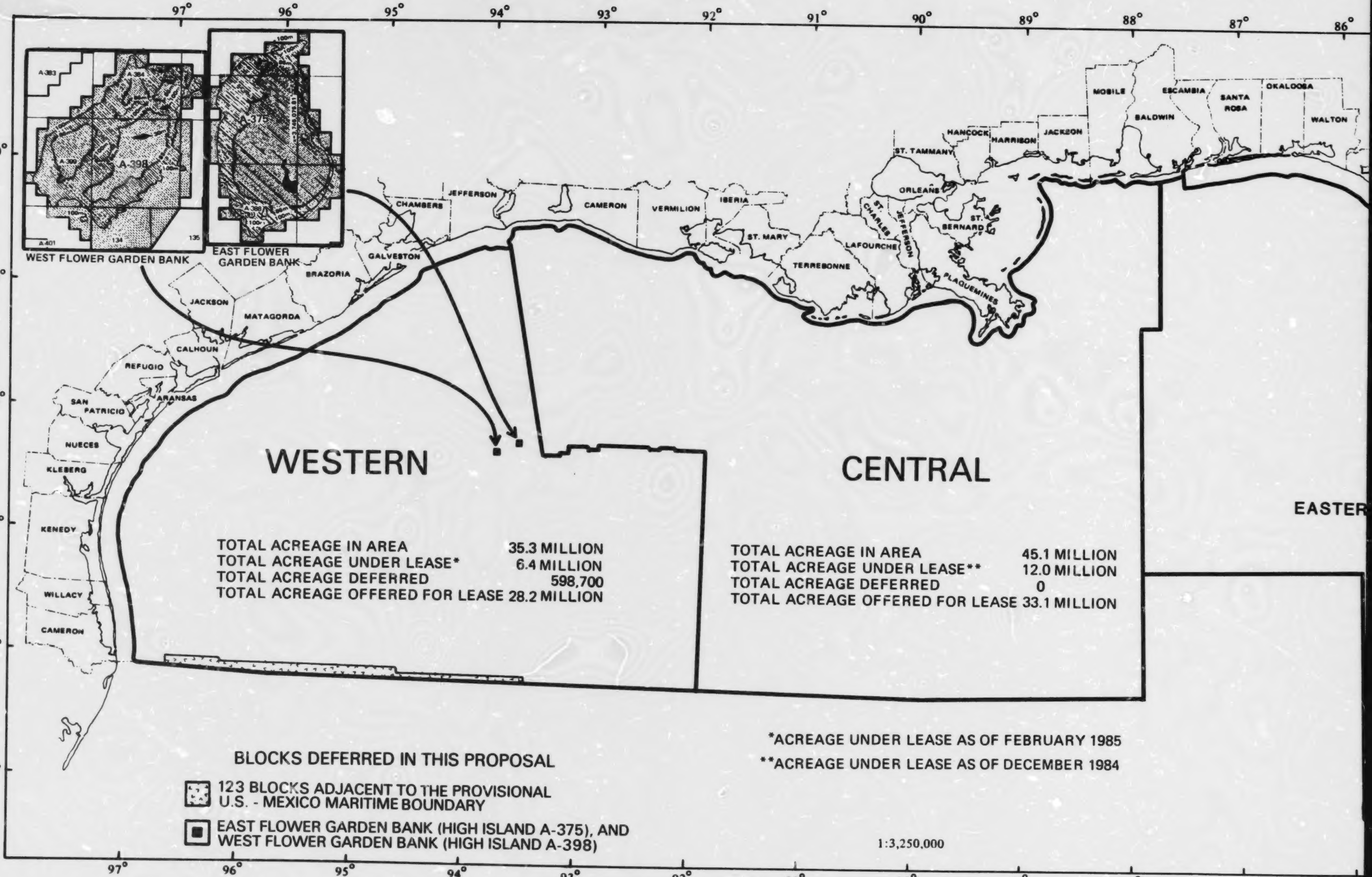
2. Scoping Activities and Findings

Scoping is the process by which issues related to the proposed actions are identified. Leasing on the Gulf of Mexico OCS has been going on for over 30 years and as a result, most of the pertinent environmental and socioeconomic issues have been known for some time. As for all previous EIS's, the Gulf of Mexico OCS Region conducted a scoping effort for this Draft EIS to further provide information for the development of appropriate mitigating measures, alternatives to the proposed actions, and to identify new issues and eliminate existing issues that may not need further treatment in the EIS. The governors of the Gulf States and nearly 1,000 other contacts, including State and Federal agencies, industry, environmental groups, and interested individuals, were given an opportunity to comment. A description of the EIS consultation and coordination process and summaries of the comments received are located in Section V.B. of this document.

a. Major Issues Analyzed in the EIS

Selection of environmental and socioeconomic issues to be analyzed was based on the following criteria:

- The resource/activity must have been identified through scoping or comments on a Draft EIS during the current 5-year program by one or more Federal, State, or local agencies; environmental groups; or knowledgeable persons.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CENTRAL
EASTER
CHAMBERS
JEFFERSON
CAMERON
VERMILION
IBERIA
ST. MARY
TERREBONNE
LAFOURCHE
ST. CHARLES
JEFFERSON
ORLEANS
ST. BERNARD
PLAQUEMINES
ST. TAMMANY
HANCOCK
HARRISON
JACKSON
MOBILE
BALDWIN
ESCAMBIA
SANTA ROSA
OKALOOSA
WALTON
GALVESTON
BRAZORIA
JACKSON
MATAGORDA
CALHOUN
REFUGIO
ARANSAS
SAN PATRICIO
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TOTAL ACREAGE IN AREA	35.3 MILLION
TOTAL ACREAGE UNDER LEASE*	6.4 MILLION
TOTAL ACREAGE DEFERRED	598,700
TOTAL ACREAGE OFFERED FOR LEASE	28.2 MILLION

TOTAL ACREAGE IN AREA	45.1 MILLION
TOTAL ACREAGE UNDER LEASE**	12.0 MILLION
TOTAL ACREAGE DEFERRED	0
TOTAL ACREAGE OFFERED FOR LEASE	33.1 MILLION

*ACREAGE UNDER LEASE AS OF FEBRUARY 1985

**ACREAGE UNDER LEASE AS OF DECEMBER 1984

BLOCKS DEFERRED IN THIS PROPOSAL

▨	123 BLOCKS ADJACENT TO THE PROVISIONAL U.S. - MEXICO MARITIME BOUNDARY
■	EAST FLOWER GARDEN BANK (HIGH ISLAND A-375), AND WEST FLOWER GARDEN BANK (HIGH ISLAND A-398)

104/105 GULF OF MEXICO OCS PLANNING

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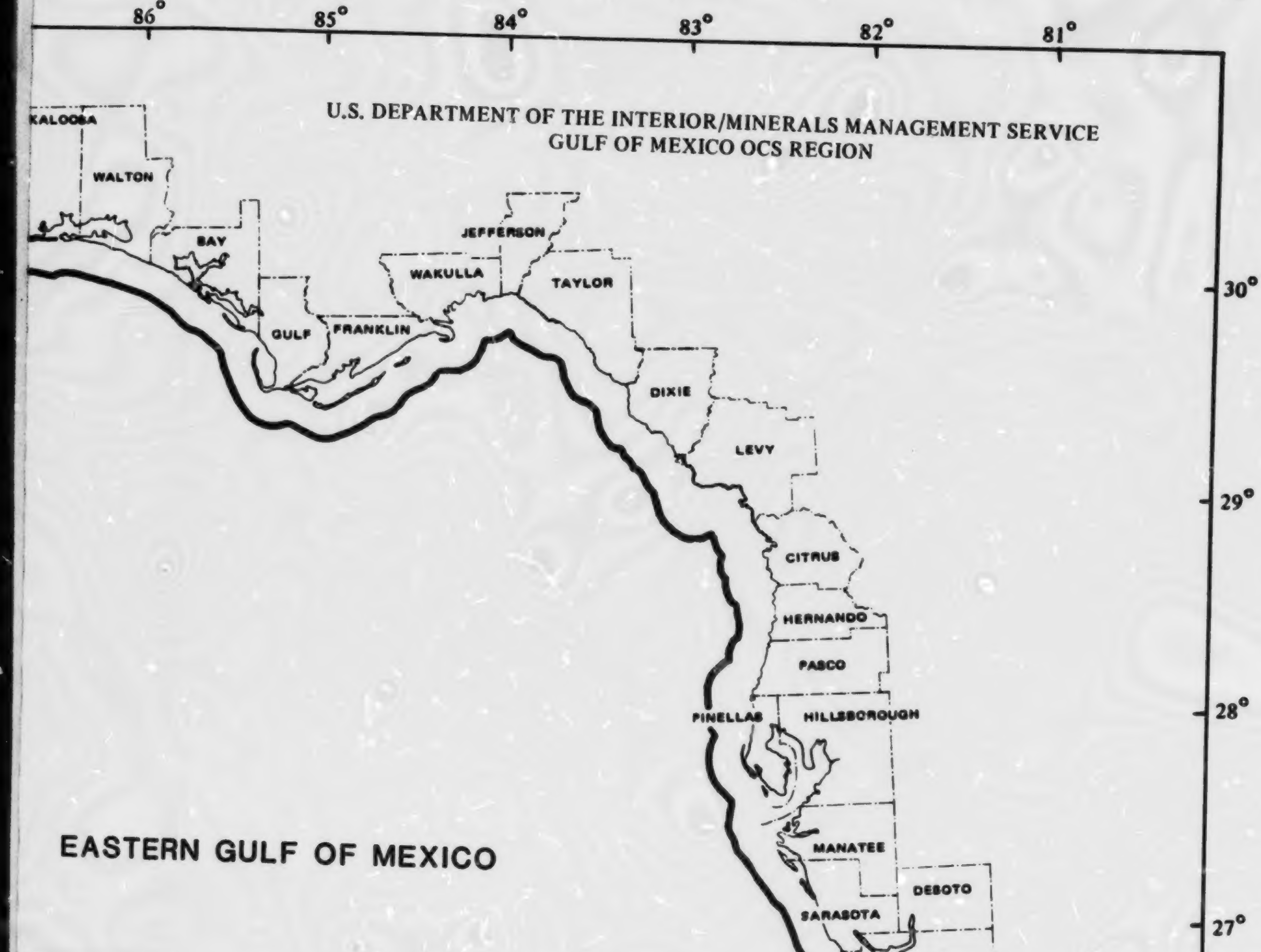
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PINELLAS
HILLSBOROUGH
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EASTERN GULF OF MEXICO
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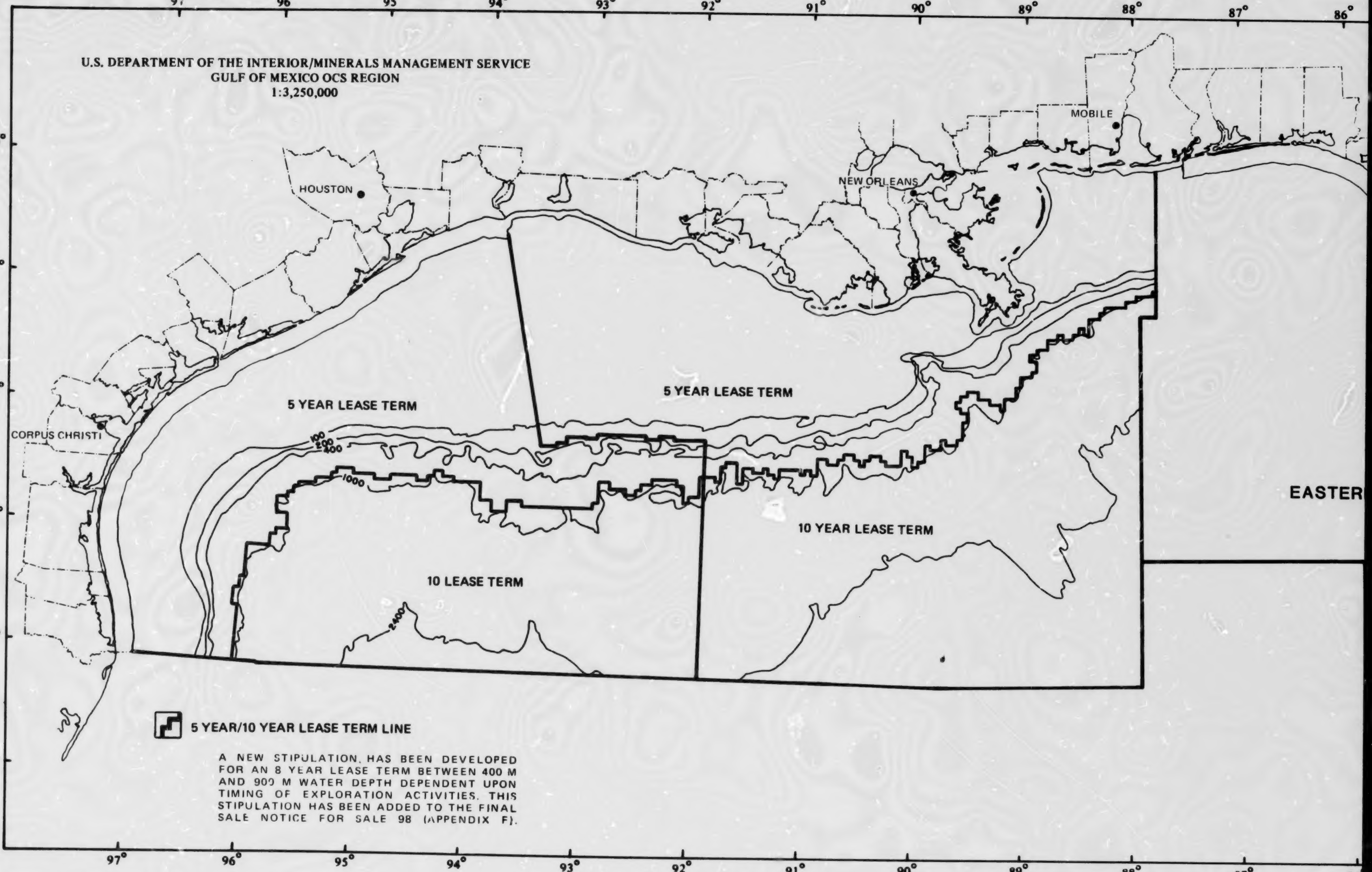
Figure I-1.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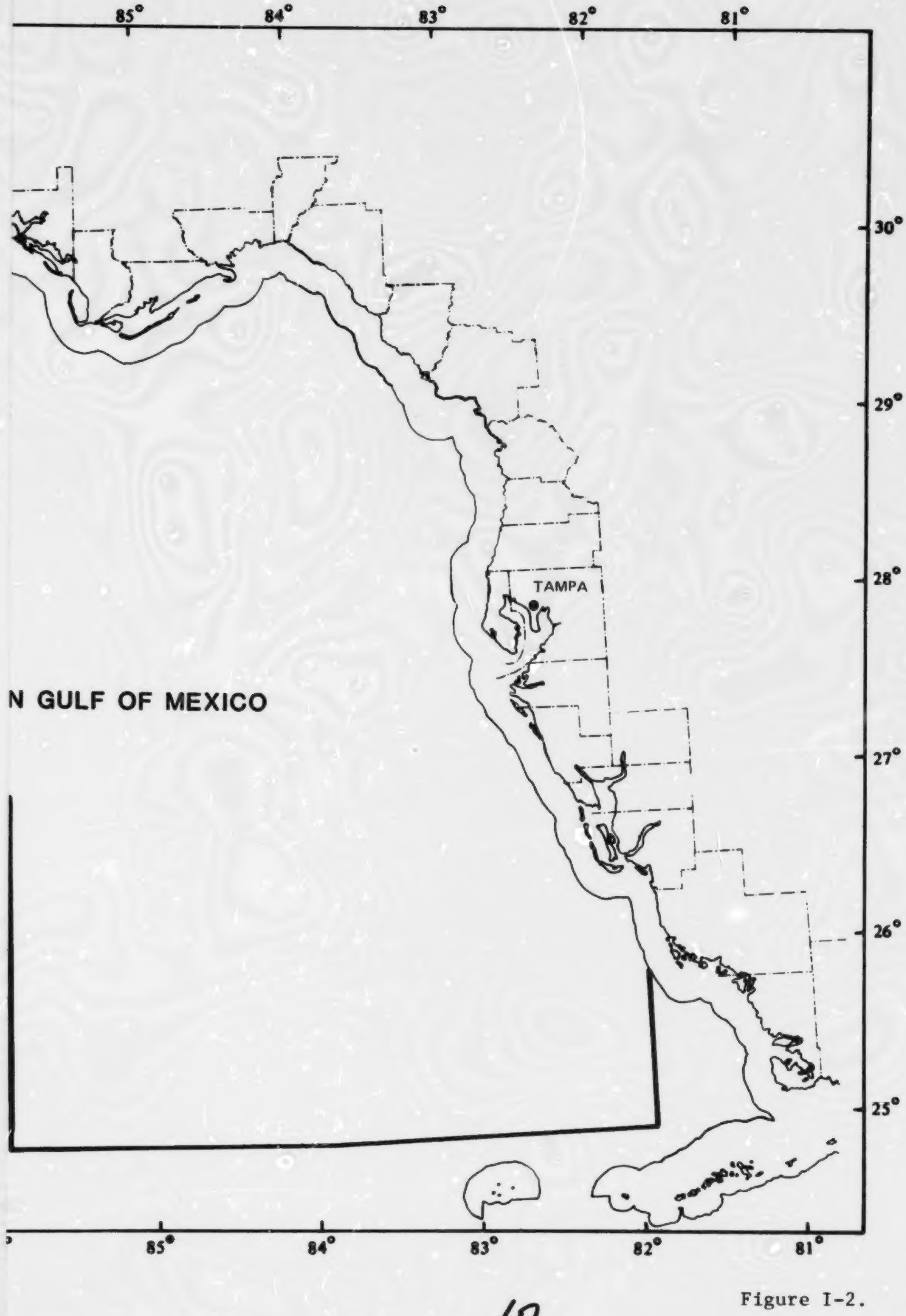
HOUSTON
NEW ORLEANS
MOBILE
CORPUS CHRISTI
5 YEAR LEASE TERM
5 YEAR LEASE TERM
10 YEAR LEASE TERM
10 LEASE TERM
EASTER
100
200
400
1000
2400
5 YEAR/10 YEAR LEASE TERM LINE

A NEW STIPULATION HAS BEEN DEVELOPED FOR AN 8 YEAR LEASE TERM BETWEEN 400 M AND 900 M WATER DEPTH DEPENDENT UPON TIMING OF EXPLORATION ACTIVITIES. THIS STIPULATION HAS BEEN ADDED TO THE FINAL SALE NOTICE FOR SALE 98 (APPENDIX F).

5 YEAR/10 YEAR LEASE TERM LINE

46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N GULF OF MEXICO

Figure I-2.

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- The resource/activity must be vulnerable to one or more important impact producing factors (IPF's). To be vulnerable, the location and temporal aspects of the resource/activity must be such that an interaction with an IPF could occur. A reasonable probability of such an interaction should exist.

- The potential must exist for a significant impact utilizing the following determining factors: sensitivity of the resource to IPF's; quantity, scarcity, and uniqueness of the resource; and economic value of the resource activity.

Using these criteria, it was determined that the following 18 issues require in-depth analysis. All major direct, indirect, and cumulative impacts of the indicated IPF's on the specific concerns are analyzed in appropriate detail; other major non-OCS IPF's affecting the identified concerns are evaluated as part of the cumulative impact analysis. Issues indicated with an asterisk(*) were the subject of responses to scoping for this Draft EIS.

Issue	Specific Concerns and IPF's	Location in EIS
*Sensitive Coastal Habitats (including wetland loss)	Seagrass beds, mangroves, barrier islands, marshes and other coastal wetlands may be affected. IPF's include oil spills, construction of navigation channels and canals, emplacement of pipelines, construction and maintenance of infrastructure, and increased vessel traffic.	Sections IV.D.1.a.(1) and IV.D.2.a.(1)
*Sensitive Offshore Habitats	Coral reefs, topographic features, live bottom areas, and seagrass beds may be affected. IPF's include mechanical damage due to anchors, emplacement of drilling and support structures, drilling operations, and laying of pipelines; damage to the biota by smothering or by toxicity of drilling fluids, cuttings, produced water, oil spills, and resuspension of sediments due to a blowout.	Sections IV.D.1.a.(2) and IV.D.2.a.(2)
Water Quality	Onshore and offshore water quality may be affected. IPF's include discharges related to catastrophic events and onshore and offshore operations.	Sections IV.D.1.a.(3) and IV.D.2.a.(3)
*Air Quality	Air quality of coastal states may be affected. IPF's include emissions from catastrophic events and onshore and offshore operations.	Sections IV.D.1.a.(4) and IV.D.2.a.(4)
Endangered and Threatened Species	Sea turtles and brown pelicans may be affected. IPF's include oil spills, increased vessel and air traffic, onshore facilities construction.	Sections IV.D.1.a.(5) and IV.D.2.a.(5)
Marine Mammals	Bottlenose dolphins and whales may be affected. IPF's include oil spills, collisions with vessels, and disturbance from OCS operations.	Sections IV.D.1.a.(6) and IV.D.2.a.(6)

Issue	Specific Concerns and IPF's	Location in EIS
Coastal and Marine Birds	Coastal and marine bird species or regional populations may be affected. IPF's include oil spills, increased vessel and air traffic, and onshore facilities construction.	Sections IV.D.1.a.(7) and IV.D.2.a.(7)
Commercial Fishing Industry	The economy of the coastal region as it relates to the commercial fishing industry may be affected. IPF's include oil spills, gear conflicts, and platform emplacement.	Sections IV.D.1.a.(8) and IV.D.2.a.(8)
Offshore Marine Recreational Fishing	Recreational fishing may be affected. IPF's include oil spills and emplacement emplacement and removal of platforms.	Sections IV.D.1.a.(9) and IV.D.2.a.(9)
Major Shorefront Recreational Beaches	Shorefront beaches supportive of intensive recreational activity may be affected. IPF's include oil spills, tar balls, debris, pipeline landfalls, and onshore facility construction.	Sections IV.D.1.a.(10) and IV.D.2.a.(10)
Cultural Resources	Unique prehistoric and historic archaeological data may be affected. IPF's include emplacement of offshore and onshore infrastructure, oil spills, and oil spill clean-up activities.	Sections IV.D.1.a.(11) and IV.D.2.a.(11)
Tourist Activity/ Industry	The economy of the coastal region as it relates to tourist activity/industry may be affected. IPF's include oil spill and trash and debris contact with recreational beaches.	Sections IV.D.1.a.(12) and IV.D.2.a.(12)
Military Use/Warning Areas	Department of Defense (DOD) use of areas designated for military operations may be affected. IPF's include emplacement of structures and increased vessel and air traffic.	Sections IV.D.1.a.(13) and IV.D.2.a.(13)
Water Supply	Existing water supplies in the adjacent coastal regions may be affected. IPF's include increases in OCS support operations and related increases in employment and population.	Sections IV.D.1.a.(14) and IV.D.2.a.(14)
*Local Employment, Income, and Population	Local employment, income, and population in the adjacent coastal regions may be affected. IPF's include the level of exploration, development, and production activity and the resulting direct, secondary, and induced employment.	Sections IV.D.1.a.(15) and IV.D.2.a.(15)

Issue	Specific Concerns and IPF's	Location in EIS
*Community Infrastructure	Demand and use of public, semipublic, and private services and facilities in adjacent coastal communities may be affected. The IPF is population growth resulting from increased OCS activity.	Sections IV.D.1.a.(16) and IV.D.2.a.(16)
*State and Local Land Use Management	Conflicts between OCS activities and coastal zone and local land use management programs may occur. The IPF is the potential conflict between OCS-generated activities/facilities and land use management programs.	Sections IV.D.1.a.(17) and IV.D.2.a.(17)
Ports and Marine Transportation	Demand for port and harbor space and existing vessel traffic patterns and safety may be affected. IPF's include increases in vessel traffic and emplacement of new structures.	Sections IV.D.1.a.(18) and IV.D.2.a.(18)

In past EIS's, impacts on designated environmental preservation areas were also analyzed. This topic continues to be a major issue of concern in the Eastern Gulf, which is not included in the proposed actions for 1986. Since there are only two such areas exposed to the OCS in the Central Gulf and none in the Western Gulf, this topic is not considered a major issue in this Draft EIS. The types of resources located in the areas exposed are, however, analyzed in Section IV.D. in the discussion of the impacts on sensitive coastal habitats and major shorefront recreational beaches.

b. Topics Raised During Scoping But Not Considered Major Issues

The following topics were identified during scoping but are not analyzed as major issues. These topics are discussed, as appropriate, in the analysis section of this document.

Vessel Anchoring on High Relief Banks: Anchoring on banks is the most serious impact producing factor to the biota of the banks and is thoroughly addressed in Section IV.D. in the discussion of the impacts on sensitive offshore habitats.

Toxic Effects of Drilling Fluids: This subject is addressed in Section IV.A.4. in the discussion of impact producing factors related to routine offshore activity and in Section IV.D. in the discussion of impacts on sensitive offshore habitats.

Removal of Structures and the Creation of Artificial Reefs: This subject is addressed in Section IV.D. in the discussions of impacts on the commercial fishing industry and marine recreational fishing.

The Nepheloid Layer: The nepheloid layer is described in Section III.B.2.

Hurricane Hazards and Evacuation: This subject is thoroughly addressed in BLM Open File Report 80-02, Severe Storm and Hurricane Impacts Along the Gulf and Lower Atlantic Coasts (DeWald, 1980). There have been no major impacts related to hurricanes on or from OCS activities since the report was published and, therefore, it remains the definitive statement on the subject. Reassessment of these findings is not considered necessary at this time.

Drilling in Disposal and Incineration Sites: There are currently no active hazardous material disposal sites in the Gulf OCS. Companies operating in areas where hazardous material (such as ordnance) may have been deposited in the past must use due caution, including conducting the required pre-drilling surveys. There is one incineration site currently established in the Gulf, but no permits for incineration at sea have been issued by the U.S. Environmental Protection

Agency (USEPA). Drilling on incineration sites presents no particular problem without incineration. MMS will, through involvement in the review process of USEPA's regulations and permits, strive to avoid potential conflicts.

c. Alternatives Recommended But Not Included in the EIS

The following alternatives were proposed during the scoping process but are not included because of the reasons cited:

Deletion of the Areas that Were in Litigation in Mississippi Sound and Seaward of the Barrier Islands off Mississippi and Alabama: An alternative was to be included for proposed Sale 104 to delete the 26 blocks contained in the area in Mississippi Sound formerly referred to as the Federal enclaves. However, on February 26, 1985, the U.S. Supreme Court ruled that the area is a "historical bay" considered to be inland waters and that the seabed and minerals below belong to the Gulf Coast States. The decision also affects portions of blocks along the State/Federal boundary seaward of the barrier islands. These blocks were deferred from Sale 98 as described in Appendix F.

Deletion of Biologically Sensitive Areas Near Topographic Highs: In the past, biological deletion alternatives have been offered for consideration in case the Secretary decided not to adopt the biological stipulation. This stipulation has been shown to be effective in preventing damage to nearby topographic features from oil and gas operations. The stipulation is now considered a part of the proposed actions, and therefore it is unnecessary to consider a deletion alternative which would delete the same blocks for which the stipulation applies.

Limitation of Areawide Leasing to the Historical Average of 550,000 Acres Per Lease Sale: MMS considers this to be a question of policy rather than an environmental issue to be addressed in an EIS.

Withdrawal of the Blocks Located Within the Section 8(g) Zone: This is also considered to be a question of policy rather than an environmental issue to be addressed in an EIS.

d. Mitigating Measures Recommended But Not Included in the EIS

The following stipulations were proposed during the scoping process but are not included because of the reasons cited:

Prohibit Discharges into Mississippi Sound: The U.S. Supreme Court's ruling that the area belongs to the Gulf Coast States precludes the need for such a stipulation.

Prohibit Drilling on the OCS Within 1,320 feet of the Alabama State Boundary to Prevent Drainage of Common Pools: MMS considers this to be a question of policy rather than an environmental issue to be discussed in an EIS.

3. Regulatory and Administrative Framework - Department of the Interior

a. Presale Activity

(1) Federal/State Coordination

The DOI has the responsibility to perform certain regulatory and administrative functions during both the presale and postsale stages. The OCSLA requires the Department to coordinate with state and local governments prior to actual leasing when their states may be affected by oil and gas activities. Specific timeframes are developed during which the Secretary provides information to the states and they, in turn, have opportunities to comment and coordinate with the Secretary.

For a more complete description of this coordination process, see Volume 1, Section I.B.3. of the Final Regional EIS.

(2) Geological and Geophysical Activity Regulations/Coordination

Geological and geophysical (G&G) surveys and analyses provide most of the resource (and hazards) information used by government and industry on the oil and gas potential of offshore areas. The collecting of G&G data begins prior to the leasing of Federal land and continues throughout the offshore mineral leasing process.

Pursuant to 30 CFR 251.4, permits must be obtained in order to conduct either geological or geophysical exploration for mineral resources or geological or geophysical scientific research of unleased areas of the Gulf OCS. "Geological exploration for mineral resources" means any operation conducted on the OCS which utilizes geological and geochemical techniques, including, but not limited to, core and test drilling, well logging techniques, and various bottom sampling methods to produce information and data on mineral resources, including information and data in support of possible exploration and development activity. "Geophysical exploration for mineral resources" means any operation conducted on the OCS which utilizes geophysical techniques, including, but not limited to gravity, magnetic, and various seismic methods, to produce information and data in support of possible exploration and development activity. "Geological or geophysical scientific research" means any investigation conducted on the OCS using solid or liquid explosives, or drilling activities for scientific research purposes involving the gathering and analysis of geological or geophysical information and data which are made available to the public for inspection and reproduction at the earliest practicable time (30 CFR 251.2(n), (o), (p)).

Permit applications for G&G activity must be submitted to the Minerals Management Service (MMS) in accordance with the requirements outlined in 30 CFR 251.5 and 30 CFR 251.6. The regulations under 30 CFR 251 do not apply to G&G exploration activities conducted by or on the behalf of the lessee on a leased block on the Gulf OCS. Geological and geophysical activities on existing leases are governed by the regulations in 30 CFR 250.

After receiving the G&G permit application, MMS prepares either a categorical exclusion review (CER), environmental assessment (EA), or EIS in accordance with applicable MMS policies and guidelines.

b. Postsale Activity Regulation/Coordination

MMS is responsible for regulating and monitoring the oil and gas operations on the Federal OCS. Accordingly, "The Offshore Gulf of Mexico Operational Handbook" (OCS Report/MMS 84-0034) was prepared to serve as a guide to MMS required regulations and procedures (Marsh, 1984). Prior to either exploration or production activities being conducted in a lease block, other than preliminary activities such as G&G activities, companies must submit plans to MMS for their review and approval. Within these plans, specific requirements must be met relative to operating conditions and considerations.

(1) Review, Coordination, and Approval of Exploration and Development Activities

(a) Exploration Plans

Pursuant to Section 11 of the OCSLA and 30 CFR 250.34-1, an exploration plan and accompanying environmental report (ER), as necessary, must be submitted for approval to MMS before an operator may begin exploratory drilling on a lease. The plan describes all exploration activities planned by the operator for a specific lease(s), the timing of these activities, information concerning drilling vessels, platforms, or other structures to be used, and other relevant information.

The operator's plan and ER provide information on the methods to be used in exploration and provide assurances of effective and environmentally sound exploration activities. The ER analyzes both offshore and onshore impacts that may occur as a result of implementation of the plan. In accordance with the Coastal Zone Management Act of 1972 (CZMA), as amended, exploration plans and certain supplemental exploration plans must contain a certification of consistency with approved

Coastal Zone Management (CZM) programs of states which could be affected by the exploration activities. States with approved programs may take up to six months for consistency reviews but must agree with or object to the certification within three months after receipt of their copy of the plan.

An EA or a CER, which determines if an action individually or cumulatively has an effect on the human environment, is prepared by MMS based on all available environmental information including the submitted plan; environmental report (when required); previous environmental documents and comments; and recommendations by the affected state(s), the U.S. Fish and Wildlife Service (FWS) (for selected plans under provisions of DM 655), and internal MMS offices. As part of the technical review of the exploration plan, MMS evaluates the proposed activity for potential impacts relative to geohazards and man-made hazards (including existing pipelines), cultural resources, endangered species, sensitive biological features, water quality, and air quality.

If the proposed activity is determined to be a categorical exclusion as outlined in Appendix I of 516 DM 2, a CER is prepared. If the proposed activity is not a categorical exclusion or if the CER determines that the proposed action is an exception to the categorical exclusions as listed in 516 DM 2.3.A.(3), the preparation of an EA is required. Extraordinary circumstances may also dictate the preparation of an EA (516 DM 2.4). An EA may be prepared on any action at any time in order to assist in planning and decisionmaking (516 DM 3.2.B). If the EA indicates that approval of the plan would constitute a major federal action significantly affecting the human environment and an existing EIS addressing the matter does not exist, an EIS must be prepared. On the basis of the EA, CER, or EIS findings and the plan completeness review, the exploration plan will be either approved, disapproved, or modification of the plan will be requested of the operator.

After approval of the exploration plan and environmental report and prior to drilling, the lessee must file an Application for Permit to Drill (APD). The APD is approved by MMS after a detailed review of the application and a hazard analysis of the drill site ensures that all required information has been submitted and the state's consistency concurrence has been received for the exploration plan. Other permits required prior to exploratory drilling include permits for aids to navigation from the U.S. Coast Guard (USCG), permits for installation of structures attached to the seabed from the U.S. Army Corps of Engineers (COE), and National Pollutant Discharge Elimination System (NPDES) permits from the U.S. Environmental Protection Agency (USEPA).

(b) Development Plans

Development and production plans are not required for leases in the Western Gulf pursuant to 30 CFR 250.34-2(a)(2), effective January 13, 1984. (In this designation, the Western Gulf includes all areas of the Gulf of Mexico except those that are adjacent to the State of Florida.) However, information covering these leases is required to ensure conformance with the OCSLA, other laws, applicable regulations, and lease provisions and to enable MMS to carry out its functions and responsibilities. Therefore, prior to any development and production activity being conducted on a lease in the Western Gulf, the operator must prepare and submit to MMS information which will be referred to as a Development Operations Coordination Document (DOCD), and, as necessary, an accompanying environmental report. A DOCD shall be considered a development and production plan for the purpose of any references in any law, regulation, lease provision, agreement, or other document referring to the preparation or submission of a plan. As outlined in the Notice to Lessees (NTL) 84-1 effective February 10, 1984, a DOCD should include:

(1) a brief description of the specific work to be performed, including the approximate commencement date and the estimated life of the project;

(2) a brief description of safety and pollution prevention and control equipment and operations to be used in the course of development and production operations;

(3) a brief description of the type of drilling vessel(s) to be used and/or platform(s) to be installed;

(4) a plat showing the projected surface and bottom-hole location of each proposed well;

(5) if not previously submitted with an exploration plan, a report which evaluates the potential shallow hazards for each proposed well or platform site;

(6) a discussion of all operational lease stipulations, including the steps that have been or will be taken to satisfy the conditions of the stipulation;

(7) the location of onshore support base(s), whether existing or proposed, and a brief description of proposed travel modes, routes, and frequency; and

(8) such other relevant information and data as MMS may require.

After receiving the DOCD, MMS prepares either a CER, EA, or EIS as discussed under Exploration Plans above. As part of the review process, the DOCD and the ER are sent to the affected state(s) with an approved CZM plan for consistency certification review and comment. Section 19 of the OCSLA provides for coordination and consultation with the affected states and local governments concerning a DOCD. Under Section 19 of the Act, recommendations are required to be submitted within 60 days after receipt of a DOCD. On the basis of the CER, EA, or EIS findings and the plan completeness review, the DOCD will either be approved, disapproved, or modification of the plan will be required of the operator.

After the approval of the DOCD and prior to drilling, the operator submits to MMS specific applications, such as those for nonrental pipelines and platforms, to conduct activities described in the plan. Additional applications submitted for approval to various Federal agencies include those to USCG for aids to navigation, COE for navigation and platform installation permits, and USEPA for NPDES permits. All of these permits must be reviewed and approved by the affected states relative to consistency with their CZM programs, either as described in detail in the plan or separately, before Federal agencies may approve them.

(c) Environmental Reports/Data

A lessee submitting a plan of exploration or DOCD for leases in the Western or Central Gulf of Mexico OCS is not required to submit an ER unless the proposed activities would affect a land use or water use in the coastal zone of the state with a CZM program approved pursuant to Section 306 of the CZMA. Specific guidance to lessees and operators concerning which types of activities require submission of an ER or additional environmental data is given in NTL 80-6 and subsequent letters to lessees. Under the CZMA, each state that has an approved CZM plan has the option to require information for inclusion in the ER which is different than that specifically outlined in 30 CFR 250.34-3. The states of Louisiana, Mississippi, and Alabama have approved CZM programs and have chosen to require abbreviated ER's for CZM purposes.

The submission of specific environmental data to aid in evaluating the environmental impacts of plans/activities may be required by MMS under 30 CFR 250.34-1(a)(2)(ii) and 30 CFR 250.34-2(a)(3)(ii) in areas of the Central and Western Gulf where either no ER is required or an abbreviated ER is required for CZM purposes. The submission of specific environmental data may be determined necessary if an operator's proposal includes: (1) areas of high seismic risk or seismicity and relatively untested deepwater and remote areas; (2) areas proposed or established as a marine sanctuary and/or near the boundary of a proposed or established wildlife refuge or areas of high ecological sensitivity (i.e., Flower Garden Banks); (3) areas of potentially hazardous natural bottom conditions; or (4) the use of new or unusual technology.

(d) Pipelines

Operational procedures and requirements for OCS pipelines, as stipulated in the Pipeline Procedures Handbook, are different for two major categories of lines, e.g., rental and nonrental lines. Rental lines, for which annual right-of-way fees are paid, are not wholly contained within the boundaries of a single lease, unitized leases, or contiguous leases of the same owner or operator and are regulated under 30 CFR 256 Subpart N. Nonrental lines (also referred to as lease and permit pipelines), for which no annual rental fees are charged, are wholly contained within the boundaries of a single lease, unitized leases, or contiguous leases of the same owner or operator and are regulated under 30 CFR 250.20. The Shallow Hazards NTL, 83-3, and the Cultural Resources NTL, 75-3 (Revision No. 1), dated October 1, 1982, institute requirements that supersede those in the Pipeline Procedures Handbook.

MMS pipeline permit applications are filed under 30 CFR 256.92 or 30 CFR 250.20, whichever is applicable. Detailed requirements for filing the applications are found in the Pipeline Procedures Handbook. Normally, each permit application will contain the pipeline location drawing, profile drawing, safety schematic drawing, and the pipe design data. In considering applications for permits for both rental and nonrental lines, MMS approves the design and fabrication of the pipelines and prepares a CER, EA, or EIS in accordance with applicable policies and guidelines. Pipelines directly affecting the coastal zone of a state with an approved CZM program may not be approved unless they are consistent with the approved CZM program. FWS reviews and provides comments on applications for pipelines which are near sensitive biological features or which cross into State waters.

(e) Application for Permit to Drill

The APD is reviewed for conformance to the requirements of OCS Order No. 2 and other engineering considerations.

Checks are made of the proposed casing and cementing programs considering such items as the adequacy of the physical properties of the casing for the proposed setting depths, the selection of the casing setting depths relative to the anticipated formation fluid and formation fracture pressures, and the volume and type of cement to be used. Also, the drilling fluid type and density are checked for adequacy.

The lessee is required, as part of the APD, to submit information, including schematic diagrams, on certain safety devices used to prevent loss of well control. The size, number, and pressure rating of these devices is checked for adequacy.

(f) Platform Verification Program

A program has been established by MMS which is designed to assure that offshore oil and gas structures are designed, fabricated, and installed using standardized procedures to prevent structural failures. Lessees are required to submit detailed information on any proposed structure to be erected. The program facilitates review of these structures and utilizes third party expertise and technical input in the verification process through the use of a Certified Verification Agent.

(2) Regulatory Enforcement Measures

(a) Inspections

Drilling and production compliance inspections are conducted before, during, and after operations to assure compliance with lease terms and approved plans and to assure that safety and pollution-prevention requirements of regulations and OCS Orders are met. Noncompliance with checklisted requirements for specific installations are followed by prescribed enforcement actions, consisting of written warnings or shut-ins of platforms, zones (well), equipment, or pipelines. The primary objective of initial inspections is to assure proper installation of mobile units or structures and associated equipment. After operations begin, additional unannounced inspections are held. Daily helicopter and aircraft surveillance and general observations of platforms are maintained by MMS.

(b) Special Inspection Procedures

The operator will normally request the use of oil-based muds at the APD stage if problems are anticipated or during drilling if problems are encountered. Approval is granted with the understanding that the cuttings will be treated (chemically) in the cuttings washer prior to dumping or collected and transported to shore for disposal. The latter method is used when only a small "plug" is needed to solve a problem (stuck drill pipe, etc.) or when the rig does not have the equipment to properly treat the mud.

Inspections are usually conducted for all rigs and platforms every 10-14 days, weather permitting. Inspectors try to visit operations using oil-based muds more often, or at least make an effort to "fly-by" when in the area.

Of initial importance to inspectors is the presence or absence of a "visible sheen" in the waters adjacent to the rig. On-board inspection involves seeing that the muds and cuttings are being properly tested and/or disposed of. The "bucket test," which involves dropping 2-3 handsful of cuttings into a bucket of seawater to test for residual oil, is the final step.

District personnel inspect H_2S sensors to make sure that they are operational, inspection logs for timely calibration of instruments and to ensure that rig personnel have been trained in appropriate equipment handling, safety regulations, and emergency procedures.

(c) Suspension of Operations and Cancellation of Leases

Section 5(a) of the OCSLA and regulations appearing in 30 CFR 250.12 provide for the suspension or temporary prohibition of an operation or activity:

(1) when the lessee fails to comply with the appropriate laws, regulations, or orders;

(2) when there is a threat of immediate harm or serious irreparable damage to life (including aquatic life), property, mineral deposits, or environment;

(3) when in the interest of national security or defense;

(4) for any purpose necessary for the implementation of the National Environmental Policy Act (NEPA); and

(5) at the request of the lessee if the Director determines that the request is in the national interest and will (a) facilitate proper development of the lease, (b) allow for construction or negotiation for the use of transportation facilities, or (c) facilitate installation of equipment determined necessary by the Director.

The Secretary may cancel a lease or permit if, after a hearing, he determines: (1) that continued activity would probably cause serious harm or damage to life, to property, the environment, or national security or defense; (2) that the threat of harm or damage will not disappear or decrease to an acceptable extent within a reasonable time; and (3) the advantages of cancellation outweigh the advantages of continued activity. A lease may be cancelled only following suspension or temporary prohibition on a lease or permit continuously for a period of five years (or for a lesser period at the request of the lessee).

(d) Remedies and Penalties

Under Section 24 of the OCSLA and regulations appearing at 30 CFR 250.80, both civil and criminal penalties can be assessed for failure to comply with responsibilities under the law, a license, a permit, or any regulation or order issued pursuant to the Act. Further, under Section 5 of the OCSLA, the issuance and continuance in effect of any lease or of any assignment or other transfer of any lease shall be conditioned upon compliance with regulations issued under the OCSLA.

(3) Environmental Safeguards

(a) OCS Orders

OCS Orders are administered by MMS and deal specifically with technical matters or problems of a particular geographical area. They supplement regulations governing drilling and production operations on the OCS as listed in 30 CFR 250. The 14 Gulf of Mexico OCS Orders deal with operational aspects of OCS activities such as drilling operation rules and permit requirements, plugging and abandonment procedures, production safety systems on all OCS platforms, specifications for workover procedures, pollution prevention, and approval procedures for oil and gas pipelines on the OCS. For a more complete description of the OCS Orders, see Volume 1, Section I.B.3.b.(1)(f) of the Final Regional EIS.

(b) Lease Stipulations

Oil/gas exploration and development activities on the OCS have the potential for causing adverse environmental impacts; therefore, stipulations are developed prior to the sale (discussed under Sections II and IV in this document) and are attached to the lease instrument, as necessary, in the form of additional mitigating measures. Biological, cultural resources, and military areas stipulations are those which have been attached most often to the leases in previous Central and Western Gulf lease sales. MMS is responsible for ensuring full compliance with stipulations appended to leases.

(c) Air Quality

Section 5(a)(8) of the OCSLA provides that the Secretary shall promulgate and administer regulations to provide for compliance with the National Ambient Air Quality Standards (NAAQS) pursuant to the Clean Air Act. This has been accomplished through 30 CFR 250.57 and administered by MMS as a postsale activity. It is the intent of 30 CFR 250.57 to protect onshore ambient air quality and to ensure that OCS activities do not prevent attainment status. The criteria pollutants which are regulated are carbon monoxide, total suspended particulates, sulfur dioxide, nitrogen oxides, and volatile organic compounds.

Plans of exploration, plans of development and production (which include some pipelines), and DOCD's have been determined by the Secretary as activities regulated under 30 CFR 250.57. These regulations provide for the following:

- All new or revised exploration, development and production plans, and DOCD's submitted on or after June 2, 1980, shall include air emissions information sufficient to make an air quality determination.

- A review is made relative to each plan submitted and the levels of expected emissions, as opposed to the exemption formulas, are outlined. There are provisions for required controls for those facilities found nonexempt by the aforementioned formulas.

- If MMS or an affected state submits information which demonstrates that emissions from an otherwise exempt facility will significantly affect any onshore area, additional information is collected and reviewed for that facility.

(d) Best Available and Safest Technology

According to Section 21(b) of the OCSLA, all new drilling and production operations and existing operations, whenever practicable, must use the best available and safest technology (BAST) which the Secretary determines to be economically feasible. BAST is not required when the Secretary determines that the incremental benefits are clearly insufficient to justify increased costs; likewise, it is the responsibility of an operator on an existing operation to demonstrate why application of a new technology would not be feasible. This requirement is applicable to equipment which, if it failed, would have a significant effect on safety, health, or the environment, unless benefits clearly do not justify the costs.

(e) Pipelines

Regulations contained under 30 CFR 256 Subpart N provide procedures for the granting of and administration of rights-of-way for the transportation of minerals by pipeline through the OCS. Additional regulations may be imposed on rights-of-way grants issued by MMS for pipelines and accessory structures. OCS Order No. 9 further regulates and requires that all pipelines shall be installed and maintained to be compatible with trawling and other operations. Locations of pipelines and platforms are shown on maps produced by MMS, the National Ocean Survey (NOS), and the U.S. Geological Survey (USGS). FWS also reviews applications for operations and proposed pipeline rights-of-way that may impact biologically sensitive areas as well as those applications that indicate a crossing of coastal land and water areas. For additional information, see Volume 1, Sections I.B.3.b.(6) and (7) of the Final Regional EIS.

(f) Other Environmental Safety Controls

Besides its regulations, OCS Orders, and lease stipulations, MMS has two mechanisms which may be utilized to control or mitigate environmental or safety problems which may arise. NTL's may be issued which define operational problems and necessary actions for solution. In addition, conditions which may be necessary to provide environmental protection may be applied to any permits, rights-of-use, or easements.

(4) Regional Technical Working Group

In 1979, DOI established the Outer Continental Shelf Advisory Board following the requirements of the Federal Advisory Committee Act (5 U.S.C. Appendix I). The purpose of the Board, as set out in the charter, is to provide advice to the Secretary of the Interior, the Director, and other officers of MMS in the performance of discretionary functions of the OCSLA, as amended.

The Board is made up of three elements: the Policy Committee, the Scientific Committee, and six Regional Technical Working Groups (RTWG). The Policy Committee advises the Secretary concerning discretionary functions, including all aspects of OCS exploration and development. The function of the Scientific Committee is to advise the Director on the feasibility, appropriateness, and scientific value of the Environmental Studies Program. The RTWG advises the Director on technical matters of regional concern relating to offshore minerals management.

The Gulf of Mexico RTWG is composed of State and Federal representatives, industry specialists, environmental interests, and people with special interests in the OCS. The purpose and objectives of the RTWG is to convene these various representatives of interests that may be affected by MMS's minerals leasing program, to provide a flow of information between the parties, and to advise the Director on technical matters of regional concern regarding the presale and postsale activities. The Gulf committee is primarily involved in reviewing and commenting on technical aspects of various sale activities and related documents and in reviewing proposals and plans for conducting environmental studies. In addition, the group participated in the first edition of a regional transportation plan for pipelines in 1981.

The information sought by MMS through the RTWG is primarily for use in developing scenarios, alternatives, and raising issues in EIS's, as well as recommending specific regional environmental studies. Potential difficulties can often be resolved early in the sale process. The opportunity exists for discussions and exchanges of technical information.

The Gulf of Mexico RTWG held its first meeting in October 1979, has been actively involved in carrying out various program objectives, and has participated in the following presale activities for proposed OCS sales in 1986:

November 29, 1984 - New Orleans, LA	The Information Transfer Meeting in New Orleans included an RTWG Business Meeting. A scoping briefing was held on the proposed 1986 sales, which included reporting on the request for resource reports, the Call for Information results, Area Identification, major issues, the Draft EIS planning schedule, and milestones through the sale.

4. Other Federal Agency Regulatory/Administrative Measures

a. Navigation

Responsibilities for regulating navigation on the OCS are shared by USCG, the Federal Aviation Administration (FAA) and COE. A detailed description of these responsibilities may be found in Section I.B.4.a. of the Final EIS supporting the Proposed Oil and Gas Lease Offerings for the Central Gulf of Mexico (Sale 81, April 1984) and Western Gulf of Mexico (Sale 84, July 1984), hereinafter referred to as Final EIS 81/84, for the purpose of simplification (USDI, MMS, 1983b). Since that EIS, COE has changed the permitting process covering the siting of mobile drilling units (MODU's), fixed structures, and pipelines with regards to their impact on navigation and national security.

Except under overriding national security contingencies, such MODU's, structures, and pipelines can, in most instances, be covered by the nationwide COE permit program provision (33 CFR 330.5(a)(8)) that does not ordinarily involve an individual or regional COE permit action.

b. OCS Pipelines

Regulatory processes and jurisdictional limits concerning pipelines on the OCS and in coastal areas are shared by several Federal agencies (DOI, DOT, FERC, COE, and USCG) as shown in Volume 1, Section I.B.4.b. of the Final Regional EIS. Aside from pipeline regulations, these agencies have the responsibility of overseeing and regulating the following areas: the placement of structures on the OCS and pipelines in areas that affect navigation; the certification of proposed projects involving the transportation or sale of interstate natural gas, including OCS gas; the right of eminent domain exercised by pipeline companies; and wellhead pricing controls for certain gas produced on the OCS.

c. Coastal Zone Management

Seven of the nine largest metropolitan areas in the United States exist within the coastal zone, and more than 50% of the population lives within 50 miles of the coastline. This has caused a diversity of increasing multiple use pressures, such as recreation, plant sitings, community development and services, and expansion of port and marine facilities. As a result of the interface between coastal resources and land use conflicts, the CZMA (16 U.S.C. 1451-1464) was enacted. The Act is administered by the Office of Ocean and Coastal Resource Management (OCRM) which was formerly named the Office of Coastal Zone Management and which is under National Ocean Service of the National Oceanic and Atmospheric Administration (NOAA) within the Department of Commerce (DOC). The CZMA sets major goals for the protection of natural, historic, and cultural resources, and it provides for increased recreational access, the management of coastal development, and the coordination and streamlining of Federal and State decisions directly affecting the coastal resources. A Federal action directly affecting the coastal zone must be consistent with an affected coastal state's federally approved coastal management plan. If a serious consistency disagreement arises, mediation can be undertaken with the Secretary of Commerce.

The Act also provides Congress the opportunity to provide aid to the states in the form of grants. Section 305 authorizes grants for development of management programs for land and water resources in the coastal zone. Section 306 authorizes grants of not more than 80% of the program's administrative costs. Section 307 deals with interagency coordination and cooperation. A more detailed discussion of these CZMA sections has been given in Section I.B.4.c. of Final EIS 81/84.

Concern over accelerated energy exploration and development on local economies, social patterns, and the environment, particularly in coastal areas, resulted in the Coastal Energy Impact Program (CEIP), Section 308, of the CZMA Amendments of 1976. Since its establishment, CEIP has awarded millions of dollars in grants and loans to affected coastal states to prevent or mitigate the adverse impacts of OCS energy development. These grants include OCS Formula Grants, Environmental and Recreational Loss Grants, Planning Grants, and Credit Assistance. The OCSLA, as amended (P.L. 95-372), changed CEIP by adding the OCS State Participation Grant Program under the new Section 308(c)(2) of the CZMA to allow coastal states to carry out their responsibilities under the OCSLA. These grants are used for participation in policymaking, planning, and managerial decisions relating to the development of OCS oil and natural gas resources. To be eligible for a grant, a coastal state must have an approved management plan under Section 306, or, in the judgment of NOAA's Assistant Administrator, be making satisfactory progress toward the development of a management program which is consistent with Section 303 policies.

Of the four states affected by these sales, only Texas does not have an approved CZM plan. In a letter from the Governor, Texas formally withdrew from the CZM program on April 30, 1981; however, they have agencies which have the responsibility of managing the various resources, such as the Air Control Board, Parks and Wildlife, Department of Water Resources, Health Department (marine life), General Land Office (environmental protection), and the Railroad Commission (regulation of oil and gas activities).

No new CEIP funds were allocated by Congress for FY 84. Louisiana received re-programmed grants under Section 308(B) and (C); $97,957 and $36,669, respectively. These grants were from allocations made prior to FY 82.

d. Cultural Resources Legislation

The Federal Government's involvement in cultural resource management and protection on the OCS is based on the requirements of the National Historic Preservation Act of 1966, as amended, which states, in effect, that any Federal agency, prior to approving federally permitted or federally funded undertakings, must take into consideration the effect of that undertaking on any property listed on, or eligible for, the National Register of Historic Places. Implied in this legislation and Executive Order 11593 is that an effort be made to locate such sites prior to development of an area. Section 11(g)(3) of the OCSLA, as amended, states that "such exploration (oil and gas) will not . . . disturb any site, structure, or object of historical or archaeological significance."

e. Endangered Species Act of 1973

The Endangered Species Act of 1973 (16 U.S.C. 1531-1543, 50 CFR 17), as amended, is administered by FWS and the National Marine Fisheries Service (NMFS), and it establishes a national policy designed to protect and conserve endangered and threatened species and the ecosystem upon which they depend. Section 7 of the Act, governing interagency cooperation, requires Federal agencies to consult with FWS and NMFS to ensure that their actions do not jeopardize the continued existence of an endangered or threatened species and/or result in adverse modification or destruction of their critical habitat.

f. Marine Mammal Protection Act of 1972

The Marine Mammal Protection Act of 1972 [16 U.S.C. 1361-1407, 86 Stat. 1027 (1972), 95 Stat. 979 (1981)], as amended, establishes a national policy designed to protect and conserve marine mammals and their habitats. Authority for administering the Act has been delegated to the NMFS, which is responsible for all cetaceans and pinnipeds (except walrus), and FWS, which is responsible for walrus, sea otters, manatees, and dugongs. The Act specifically prohibits the harassing, hunting, capturing, or killing of any marine mammal unless otherwise exempted under provisions of the Act. The Marine Mammal Commission is responsible for advising Federal agencies on the protection and conservation of marine mammals. The Commission has a Committee of Scientific Advisors which provides advice on actions needed to fulfill the purposes of the Act.

g. Fishery Conservation and Management Act of 1976

The Fishery Conservation and Management Act of 1976 (FCMA) (16 U.S.C. 1801-1882) established a fisheries conservation zone off the coasts of the United States and its possessions from the states' seaward boundary to a line that is 200 nmi from the baseline from which the territorial sea is measured. The Act created eight Regional Fisheries Management Councils and mandated a continuing planning program by the Councils. As a part of this program, a Fishery Management Plan (FMP) must be prepared for each species (or related group of species) of fish harvested within each respective region.

The Act, as amended, requires that a FMP based upon the best available scientific and economic data be prepared for only those species (or related group of species) of fish harvested within each respective region that is in need of conservation and management.

The FMP for shrimp was implemented in May 1981; the FMP for stone crab was implemented in March 1982; the FMP for spiny lobster was implemented in April 1982; the FMP for coastal pelagics was implemented in February 1983; the FMP for coral was implemented in August 1984; and the FMP for reef fish was implemented in November 1984. The FMP for billfish and swordfish may be implemented in 1985.

The shrimp plan includes a seasonal closure off the coast of Texas which will run from about June 1-July 15 each year to allow for a longer period of growth for the shrimp. Under the shrimp plan, it is estimated that the cooperative closure of State and Federal waters off the coast of Texas provided about 8.9 million extra pounds of shrimp in 1981 and 4.2 million extra pounds in 1982. Also, the plan provides for a permanent closure of the Tortugas shrimp nursery off Florida.

For a more detailed description of the Fishery Conservation and Management Act of 1976, see Volume 1, Section I.B.4.g. of the Final Regional EIS.

h. Maritime Boundary

The Treaty on Maritime Boundaries between the United States and Mexico signed on May 4, 1978, is awaiting Senate ratification. In the meantime, the United States and Mexico are applying the boundary lines provisionally. Although the area of analysis straddles the boundary in places, only submerged lands north of that boundary in the WPA can be offered for lease. The 123 blocks immediately adjacent to the boundary have been deferred from proposed Sale 105 as shown on Figure I-1.

i. National Fishing Enhancement Act of 1984

Title II of Public Law 98-623, also known as the Artificial Reef Act, establishes a National policy of the United States to encourage the development of artificial reefs which will enhance fishery resources and commercial and recreational fishing. The Secretary of Commerce is directed to take the lead in developing National standards and a National Artificial Reef Plan that identifies design, construction, siting, and maintenance criteria for artificial reefs, and to provide a synopsis of existing information and future research needs on artificial reefs. The Secretary of the Army will issue permits to responsible applicants for reef development projects in accordance with the National standards and plan, as well as regional and local criteria and plans. The new law also limits liability of reef developers complying with permit requirements and amends the Reefs for Marine Life Conservation Law to include the availability of all surplus Federal ships for consideration as reef development materials. Although the Act mentions no specific materials other than ships for use in reef development projects, the Secretary of the Interior is required to cooperate with the Secretary of Commerce in developing the National plan. The Secretary of the Interior has already taken several initiatives in support of this National policy by creating the Recreational and Environmental Enhancement and Fishing in Seas (REEFS) task force and is cooperating with ocean industries through MMS in developing a Rigs-to-Reefs policy and program.

5. Regulations Governing Oil Spills, Petroleum Effluents, and Other Discharges

The Federal Water Pollution Control Act of 1972 (33 U.S.C. 1251 et seq.) (FWPCA), as amended, and commonly called the Clean Water Act, provides a major tool to the Federal Government to ensure that the chemical, physical, and biological integrity of the Nation's waters are maintained. It provides a comprehensive plan for dealing with oil spills and discharges of oil and oil-containing substances into Gulf waters in connection with activities under the OCSLA, as amended. The FWPCA addresses prevention and control of spills, response to and removal of spilled oil, and for the determination of liability and compensation for damage resulting from spills. These aspects of the FWPCA are discussed in Volume 1, Sections I.B.5.a.(1), b., and c.(1) and (2) of the Final Regional EIS.

Other important acts under which regulations have been promulgated to minimize pollution incidents and the potential environmental and economic damage caused by the release of pollutants from various sources to Gulf waters include the OCSLA, as amended, the Ports and Waterways Safety Act of 1978, and the Comprehensive Environmental Compensation and Liability Act (CERCLA), or "Superfund." Other acts which exert a lesser influence due to their restricted applicability in the Gulf include the Deep Water Port Act of 1974 and the Trans-Alaskan Pipeline Authorization Act. The Clean Air Act provides for regulations controlling air emissions from shorebased OCS-related facilities. The legal mandates and regulations relative to pollution control established by these Federal statutes, along with the administering Federal departments and agencies, are detailed in the Final Regional EIS.

Except for the changes or updated material described below, the information provided in Volume 1, Sections I.B.5.a.-d. of the Final Regional EIS, Section I.B.5. of Final EIS 81/84, and Section I.B.5. of Final EIS 94/98/102 is correct.

National Pollution Discharge Elimination System (NPDES)

USEPA Regions IV and VI, which have regulatory authority in the Gulf of Mexico, are in the process of developing effluent guidelines for discharges from offshore oil and gas extraction operations and developing a more comprehensive evaluation of the effects of these discharges on the marine environment. The development of these guidelines and additional information on the effects of the discharges will enable the Agency to propose and issue 5-year term general permits for actions submitted after October 26, 1984. Pending issuance of the general 5-year permit, the existing three general permits for the Central and Western Gulf, which expired on April 29, 1983, had been reissued as of October 17, 1983, (48 FR 41494) but expired June 30, 1984. The Public Notice of the Draft General NPDES Permits for Oil and Gas Operations in Portions of the Gulf of Mexico appeared in the Federal Register on April 4, 1983 (48 FR 14440) and the deadline for comments closed May 16, 1983. The final rule for the NPDES permit program was published in the Federal Register on September 26, 1984.

Ocean Dumping Program

The USEPA has designated and approved an ocean dumping site for the dumping of dredged material in the Gulf of Mexico offshore of Galveston Harbor. The location of the disposal site is approximately 3.7 nautical miles southeast of Galveston Island and occupies an area of approximately 6.6 square nautical miles. This information was published in the Federal Register on August 31, 1984, (49 FR 34485) and became effective October 1, 1984.

Minerals Management Service and U.S. Coast Guard Surveillance Patrols

MMS is currently rewriting the OCS Orders, and there is currently a plan to incorporate the OCS Orders into regulation 30 CFR 250. Presently, under OCS Order No. 9.E., MMS receives annual inspection reports which are furnished by pipeline operators. The operators are required to maintain pipelines in good operating condition at all times and to inspect them on a monthly basis for an indication of leakage using aircraft, floating equipment, or other methods. Records of these inspections include inspection dates, methods utilized, and the results of each inspection. The USCG conducts weekly MARPOL 73/78 surveillance overflights (See Section I.B.5. of Final EIS 81/84, International Measures, for a discussion of MARPOL). These patrol areas are broken down by zones based on the amount of vessel traffic: Miami to Key West (four flights weekly); Melborne to Miami (three flights weekly); and Mobile to Port Arthur (one flight weekly). Patrols concentrate surveillance from 12-50 miles offshore in each of the coverage areas with 10% of the flights devoted to patrols from 50-100 miles offshore.

Department of Transportation's Oil and Hazardous Substance Prevention Requirements

USCG has the responsibility for pollution prevention of the Nation's navigable waters. When this prevention proves impossible, they bear the responsibility of identifying, controlling, and cleaning up the oil or other contaminants which pollute United States' waters, except when MMS's authority over OCS oil and gas exploration activities supersedes their authority.

Section 4 of the OCSLA grants authority to USCG to promulgate and enforce regulations covering lighting and warning devices, safety equipment, and other safety-related matters pertaining to life and property on fixed OCS platforms and drilling vessels. New requirements for cargo lightering operations were published in the Federal Register on March 26, 1984. This final rule establishes regulations for the lightering of oil and hazardous material cargoes in bulk from one vessel to another in the marine environment surrounding the U.S. Certificates of Inspection, or for foreign vessels, a Certificate of Compliance, must comply with MARPOL 73/78.

33 CFR 1 and 153 have been revised and published in the Federal Register dated January 5, 1984. This rule delegates authority to USCG officials to perform pollution response functions under CERCLA.

33 CFR 140-147 provide the USCG with requirements for safety equipment and other matters relating to safety promotion of life and property on the artificial islands and fixed structures located on the OCS, as established in Section 4(c)(1) of the OCSLA.

The Public Notice of the Reception Facilities requirement of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by MARPOL 73/78 was published in the Federal Register on June 19, 1984. The proposed regulation provides criteria for determining the adequacy of reception facilities and for administrative procedures for granting Certificates of Adequacy to ports and terminals. The deadline for comments closed August 20, 1984.

Department of the Interior's Prevention Programs

The MMS, Gulf of Mexico OCS Region, monitors all activities affecting safety and pollution prevention in marine oil and gas operations in the Gulf and develops and ensures OCS standards for safety and pollution control equipment and procedures. These orders are being revised and are expected to be completed July 1985.

OCS Order No. 7 provides the major specifications for preventing and controlling pollution of the environments (Section I.B.3.b.(1)(f)).

OCS Order Nos. 2, 5, and 8, with their references to the American Petroleum Institute's Recommended Practices and Standards, contain guidelines for assuring safe operations.

Regulations applicable to the BAST program, 30 CFR 250.34(a)(1), and 30 CFR 250.34-2(a)(1)(ii), (v), and (vi), require that special attention be directed to safety and pollution prevention and control features, including oil spill cleanup and containment provisions, in all exploration plans and in all development and production plans. They also describe the safety standards and features and environmental safeguards that will be employed during development and production operations.

Response Measures

The development of contingency guidelines that serve as mechanisms for coordinating an effective response to oil spills is currently being developed and addressed at all levels of government and private industry. As described in the Final Regional EIS, the State of Florida has a coastal pollutant spill contingency plan. This plan was recently updated in July 1984. In addition, the State of Texas has developed an "Oil and Hazardous Substances Pollution Contingency Plan." The Mississippi Bureau of Marine Resources has prepared a Contingency Plan for the Mississippi coastal area which is expected to be published in November 1985. Presently, Alabama does not have a contingency plan, but the information in a report entitled "Sensitivity of Alabama Shoreline Habitats to Spilled Hydrocarbons" (available from the Geological Survey of Alabama) assists the State in contingency planning and decisionmaking. This report addresses the ecological sensitivity of natural shoreline habitats to spilled hydrocarbons.

The State of Louisiana does not have a formal written contingency plan; however, the Department of Environmental Quality is developing a set of criteria which defines and establishes a process for notification in the event of a spill. The Department of Environmental Quality represents the State's Regional Response Team (RRT) and coordinates with USCG, USEPA, state police, the State Department of Fish and Wildlife, and the State Department of Health. As of this writing, there are no plans to develop a state contingency plan for Louisiana.

OCS Order No. 7

OCS Order No. 7 requires the operator to submit an oil spill contingency plan to MMS prior to approval of permit application for conducting operations with this plan being reviewed on an annual basis.

The plan must contain assurances that a full response capability is known and can be committed during an oil spill situation. Since a commitment includes specification of appropriate equipment and materials, their availability, and deployment time, it must also include provisions for varying degrees of response effort, depending on the severity of the discharge. Provisions must be established for early detection and timely notification of a spill to the responsible agencies and persons, as well as specific response actions. These provisions include identification of a trained, prepared, and available response operating team, predesignation of an oil discharge response coordinator, preplanned location for an oil discharge response operations center, and provisions for disposal of recovered material. The plan must also demonstrate a knowledge of, and strategy for, protecting areas of special biological sensitivity. This OCS Order is presently being revised and the finalization of this Order is expected in July 1985.

National Contingency Plan, as amended, by CERCLA

The revised National Oil and Hazardous Substance Contingency Plan (NCP) was published in the Federal Register on March 13, 1982, and went into effect on December 10, 1982. The final revised NCP allows on-scene coordinators (OSC) to authorize the use of dispersants in oil spill cleanups, but only if these dispersants appear on the dispersant acceptance list. The dispersant acceptance list included 28 products tested and accepted under procedures described in the 1981 NCP. USEPA has modified a section of proposed Subpart E to differentiate the oil spill cleanup activities for which Federal funds are available under Section 311(k) of the Clean Water Act, the Deepwater Port Act, the OCSLA, and the Trans-Alaskan Pipeline Authorization Act. Revised Subpart G, which designates the agencies that will act as trustees of natural resources lost or damaged following a spill, now includes a section designating states as trustees of the natural resources located within their borders. In addition, this revision incorporates a provision for DOI and DOC to act as co-trustees of resources falling under the jurisdiction of both Federal agencies. A Memorandum of Understanding (MOU) specifies the trusteeship responsibilities of each agency in areas where a pollution incident could affect the natural resources under the authority of both DOI and DOC.

Subpart H, published in the Federal Register on July 18, 1984, allows the OSC, with the concurrence of the USEPA representative to the RRT and the concurrence of the states with jurisdiction over the navigable waters polluted by the oil discharge, to authorize the use of dispersants, surface collecting agents, and biological additives on the oil discharge, provided that the dispersants, surface collecting agents, or additives are on the NCP Product Schedule. However, the OSC may use a product not on the NCP Product Schedule without obtaining the concurrence of the USEPA representative to the RRT of the states when, in the judgment of the OSC, the use of the product is necessary to prevent or substantially reduce a hazard to human life. Afterwards, the OSC is to inform the USEPA RRT representative and the affected states of the use of a product as soon as possible and obtain their concurrence for its continued use once the threat to human life has subsided.

International Measures

A meeting was held by experts from 17 island states and territories of the wider Caribbean in St. Lucia to consider and adopt a subregional Oil Spill Contingency Plan for the Caribbean Islands. The plan addresses policy and responsibility, response operations including requests for assistance, joint response operations, and the use of dispersants; reporting and communications; and administration and logistics.

It is believed that similar plans will be adopted for the Central American and South American parts of the wider Caribbean Region.

6. Interrelationship with Other Programs and Proposals

a. Estuarine and Marine Sanctuaries

The Estuarine and Marine Sanctuary programs are discussed in Volume 1, Section I.B.6.a. of the Final Regional EIS. Few changes to the program have taken place since the writing of the Final Regional EIS. See also Section I.B.6.a. of Final EIS 81/84.

Two estuarine sanctuaries, both in Florida, have been established in the Gulf of Mexico: Rookery Bay Estuarine Sanctuary and Apalachicola Bay and River Estuarine Sanctuary.

No marine sanctuaries have been established in the Gulf of Mexico; however, two are located on the Atlantic side of the Florida Keys: Looe Key National Marine Sanctuary and Key Largo Reef Marine Sanctuary.

Both estuarine and marine sanctuaries are designed and managed to meet the following goals, among others:

(1) enhance resource protection through the implementation of a comprehensive, long-term management plan tailored to the specific resources;

(2) promote and coordinate research to expand scientific knowledge of significant marine resources and improve management decisionmaking;

(3) enhance public awareness, understanding, and wise use of the marine environment through public interpretive and recreational programs; and

(4) provide for optimum compatible public and private use of special marine areas.

Only sites with special marine resources are selected for marine sanctuary status. Sites selected for consideration are evaluated on the merits of resource and human use values and on the public benefits to be derived from sanctuary status.

Under the Program Development Plan of January 1982 (described in the Final Regional EIS), NOAA established a number of Regional Resource Evaluation Teams, each to recommend "3 to 5" appropriate sites for consideration as marine sanctuaries. The Gulf of Mexico Team recommended several sites. Of these, four were selected to be placed on the Site Evaluation List (SEL) to receive further study and consideration. (The final SEL was published in 48 FR 35568-35577 on August 4, 1983). Listing a site on the SEL does not mean that the site is a proposed sanctuary or that it will necessarily be considered as an active candidate for sanctuary designation. However, with few exceptions NOAA will only consider those sites on the SEL for further review as active candidates for marine sanctuary designation. Thus, the SEL serves as the pool from which potential future marine sanctuaries will be drawn. Sites listed on the SEL that have not been reviewed for active candidate status after 5 years will be reevaluated. Of the four sites placed on the SEL for the Gulf of Mexico, only one is entirely on the OCS (the Flower Garden Banks), another is partially on the OCS, and another is a bay-estuary practically surrounded by land and separated from the Gulf by a barrier island.

The three SEL sites located in the Central and Western Gulf of Mexico are (the fourth Gulf site is the Big Bend Seagrass Beds off Florida):

Shoalwater Bay-Chandeleur Sound, Louisiana

This site includes approximate-ly 80 mi^2 (207 km^2) of state waters, including shallow water seagrass beds and algae located upon a subsiding remnant of abandoned Mississippi River delta. Adjacent to the east of this site is the Breton National Wildlife Refuge. This site is not located on the OCS.

Flower Garden Banks

Recently, the Flower Garden Banks were named an Active Candidate for designation as a national marine sanctuary (49 FR 30988-30991 of August 2, 1984). Selection of the site as an Active Candidate formally triggers the National Environmental Policy Act process. NOAA will begin to prepare a draft management plan and a draft environmental impact statement.

This site is located 110 mi (177 km) offshore, consisting of east and west sections approximately 16 mi (25 km) apart and representing the northernmost coral reef community in the Western Gulf of Mexico. The proposed borders of the sanctuary encompass a total of 44 mi^2 (114 km^2). The area is a valuable representation of a tropical coral reef community dominated by hermatypic coral (Montastrea annularis, M. cavernosa, Porites asteroides, and Diploria strigosa) and associated reef fishes and invertebrates. DOI has been protecting the biological resources of the Flower Gardens from possible damage due to oil and gas exploration and development activities by the establishment of a "No Activity Zone" in which certain restrictions on oil and gas activities are imposed.

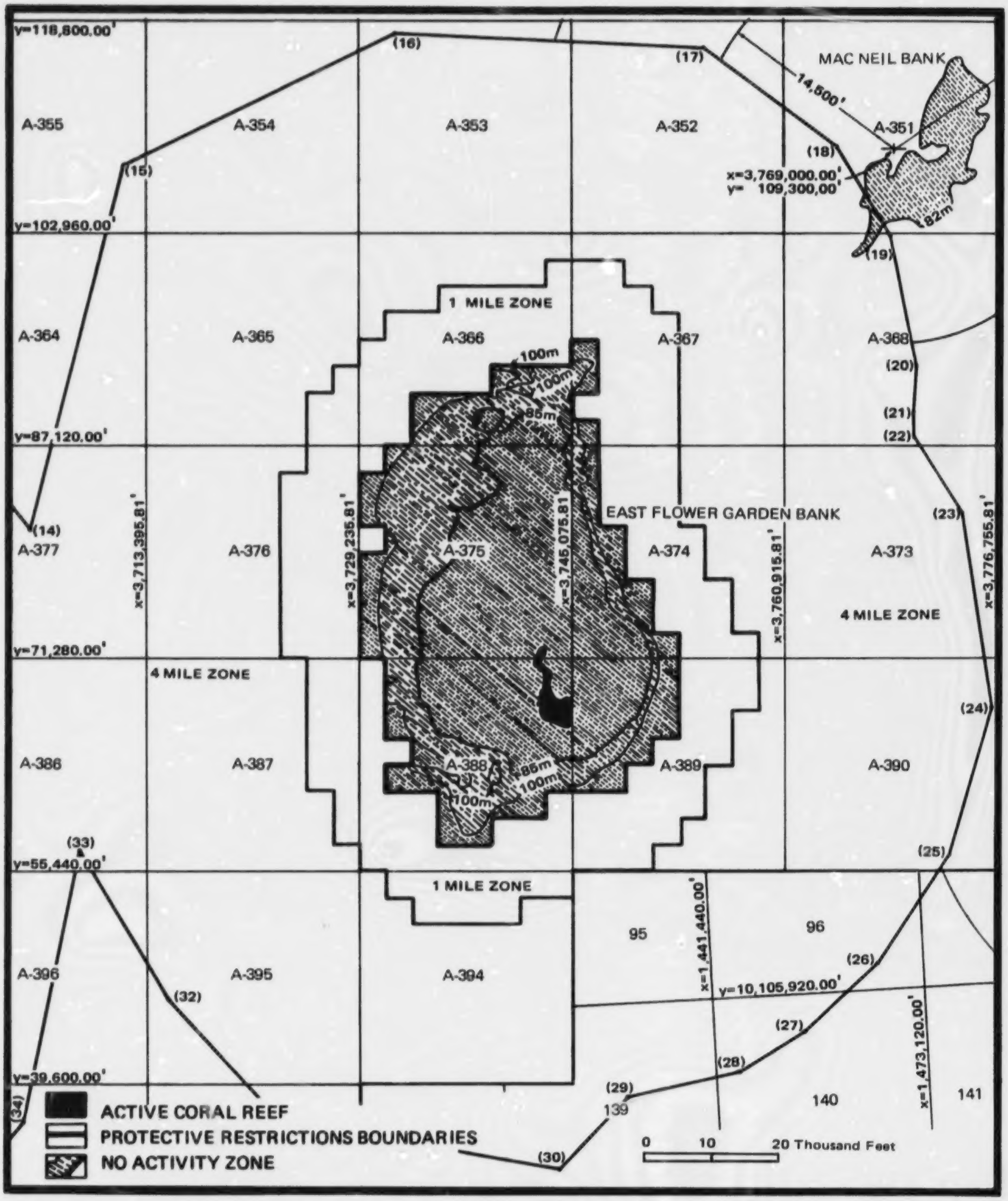

y=118,800.00'
(16)
(17)
MAC NEIL BANK
14,500'
A-355
A-354
A-353
A-352
A-351
(18)
(15)
x=3,769,000.00'
y= 109,300.00'
82m
y=102,960.00'
(19)
1 MILE ZONE
A-364
A-365
A-366
A-367
A-368
100m
100m
(20)
85m
(21)
y=87,120.00'
(22)
EAST FLOWER GARDEN BANK
(14)
(23)
A-377
x=3,713,395.81'
A-376
x=3,729,235.81'
A-375
x=3,745,075.81
A-374
x=3,760,915.81'
A-373
x=3,776,755.81'
4 MILE ZONE
y=71,280.00'
4 MILE ZONE
(24)
A-386
A-387
A-388
85m
100m
100m
A-389
A-390
(33)
y=55,440.00'
(25)
1 MILE ZONE
x=1,441,440.00'
95
96
A-396
A-395
A-394
(26)
y=10,105,920.00'
(32)
(27)
x=1,473,120.00'
y=39,600.00'
(28)
(29)
139
140
141
(34)
(30)
ACTIVE CORAL REEF
PROTECTIVE RESTRICTIONS BOUNDARIES
NO ACTIVITY ZONE
0
10
20 Thousand Feet

Figure I-3. East Flower Garden Bank, showing "No Activity Zone," "1 Mile Zone," and "4 Mile Zone." East Flower Garden Bank is in the High Island, East Addition, South Extension, Lease Area.

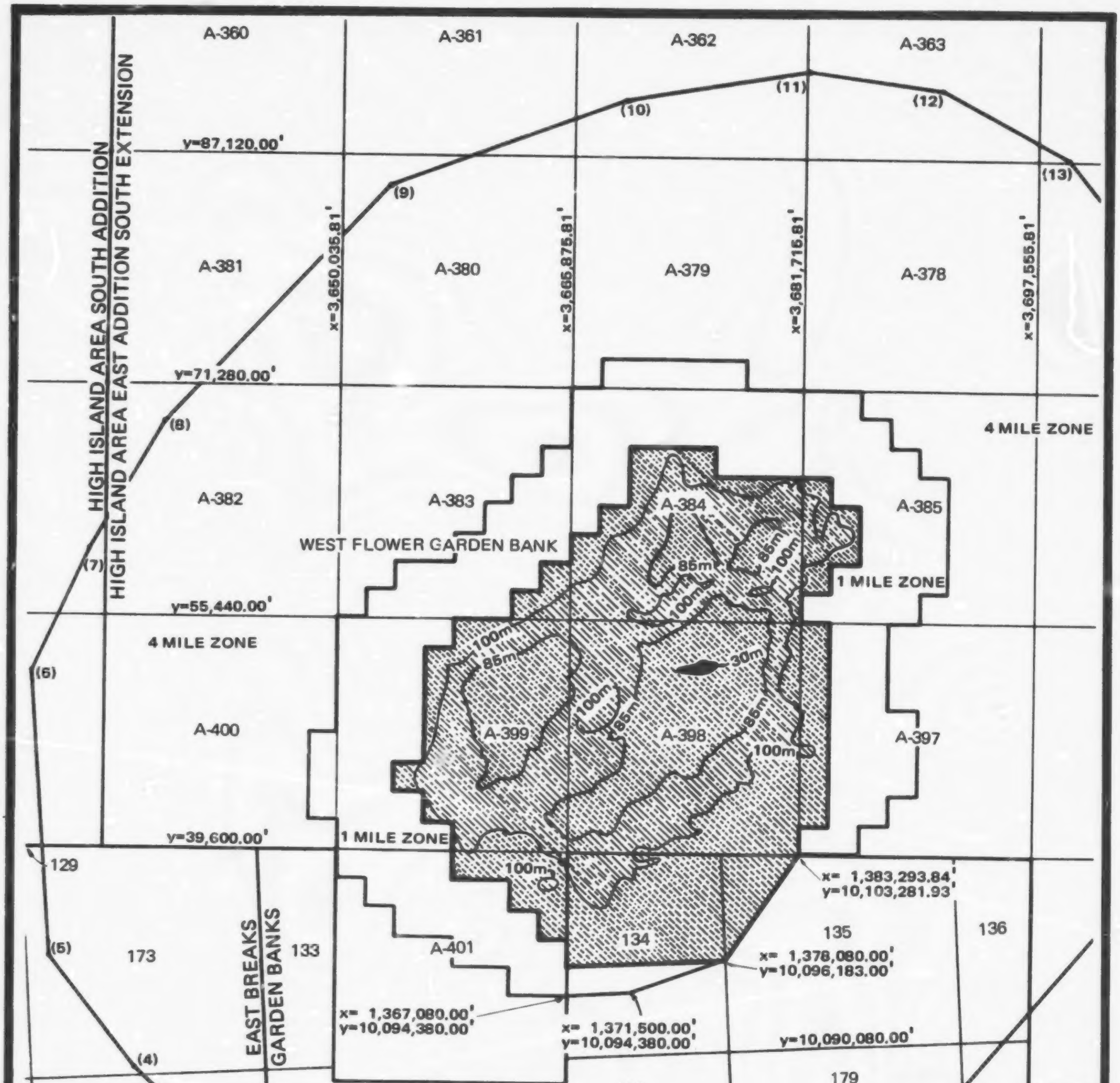

A-360
A-361
A-362
A-363
HIGH ISLAND AREA SOUTH ADDITION
HIGH ISLAND AREA EAST ADDITION SOUTH EXTENSION
(11)
(10)
(12)
y=87,120.00'
(13)
(9)
x=3,650,035.81'
x=3,665,875.81'
x=3,681,715.81'
x=3,697,555.81'
A-381
A-380
A-379
A-378
y=71,280.00'
(8)
4 MILE ZONE
A-382
A-383
A-384
A-385
WEST FLOWER GARDEN BANK
(7)
85m
100m
1 MILE ZONE
y=55,440.00'
4 MILE ZONE
30m
(6)
A-400
A-399
A-398
A-397
y=39,600.00'
1 MILE ZONE
129
x= 1,383,293.84'
y=10,103,281.93'
(5)
173
EAST BREAKS
GARDEN BANKS
133
A-401
134
135
136
x= 1,378,080.00'
y=10,096,183.00'
x= 1,367,080.00'
y=10,094,380.00'
x= 1,371,500.00'
y=10,094,380.00'
y=10,090,080.00'
(4)
177
178
179
(35)
ACTIVE CORAL REEF
PROTECTIVE RESTRICTIONS BOUNDARIES
NO ACTIVITY ZONE
(36)
(2)
(1)
0
10
20 Thousand Feet
x=1,393,920.00'
180

Figure I-4. West Flower Garden Bank, showing "No Activity Zone," "1 Mile Zone," and "4 Mile Zone." West Flower Garden Bank is in the High Island, East Addition, South Extension Lease Area.

(See the appropriate subsections of Section II and especially Figures I-3 and I-4). DOI cannot, however, protect these reefs from damage due to activities outside DOI's permitting process. For this reason, MMS supports designation of the reefs as a marine sanctuary, but only if such designation will indeed protect the reefs from non-oil and gas related activities, such as anchoring (which has been shown to be the most destructive of man's activities in the area), the use of certain heavy trawls (such as roller trawls) by fishermen, and the taking of corals and reef fishes. The Gulf of Mexico Fishery Management Council, in its proposed Fishery Management Plan for corals, has designated the area within the 50 fathom (91.4 m) isobath at the Flower Gardens as a Habitat Area of Particular Concern (HAPC), but even with such designation the Council is unable to regulate "nonfishing" activities such as anchoring of ships.

Baffin Bay, Texas

This site is not on the OCS, but is a bay-estuary system separated from the Gulf by a barrier island.

b. Deepwater Ports

The Louisiana Offshore Oil Port (LOOP), which began operation in May 1981, is the only deepwater oil port in the Gulf of Mexico. It is located in 115 feet of water in Grand Isle Block 59 approximately 19 miles from shore. LOOP's function is to facilitate the offloading of oil from vessels too large to visit conventional Gulf ports, typically supertankers, and to transport the oil to shore via pipeline. Vessel access to LOOP is by means of the designated fairway, anchorage, and safety zone (see Figure I-4 of the Final Regional EIS). No mobile drilling operations or installation of permanent structures may take place in these areas.

c. Ocean Thermal Energy Conversion

Ocean thermal energy conversion (OTEC) is a process which utilizes the temperature differences between deep, cold seawater and relative warm surface water to drive a heat engine for the generation of electricity. Thus far, OTEC and offshore oil and gas operations have never been in conflict; however, the Gulf is a prime candidate for OTEC operations primarily due to its large temperature differentials and close proximity to the continental United States. If an OTEC plant is ever established in a developed oil and gas area such as the Gulf, impacts will probably be limited to increased navigational problems and environmental implications inherent to the OTEC process. For more information on this subject, see Section I.B.6.c. of Final EIS 81/84.

d. Offshore Mining

The Secretary of the Interior is authorized under the OCSLA to issue leases for minerals other than oil, gas, and sulfur on the OCS. The Secretary is further supported by federally legislated policy to foster and encourage private enterprise involvement in mining or mineral activities (Mining and Minerals Policy Act of 1955, P.L. 83-217); to foster and encourage private enterprise in the development, reclamation, recycling, and wise disposal of domestic mineral resources (Mining and Minerals Policy Act of 1970, P.L. 91-631); and to encourage Federal agencies to facilitate availability and development of domestic resources to meet critical material needs (The National Materials and Minerals Policy Research and Development Act of 1980). While commercially exploitable mineral commodities are potentially available as surficial or near surficial deposits on the OCS, onshore supplies and an unfavorable economic climate have precluded their development. Prerequisites for future development are the evaluation of the quality and quantity of the resources, followed by technological advances and a supportive economic climate. For a more detailed discussion of offshore mining, see Volume 1, Section I.B.6.d. of the Final Regional EIS.

e. Ocean Dumping

All ocean dumping is regulated by the Marine Protection, Research, and Sanctuaries Act of 1972, as amended (33 U.S.C. 1401 et seq.). Regulations (38 CFR 28610 et seq.) implementing the Act require a USEPA permit for all ocean dumping of industrial wastes and municipal sludge materials. The Act mandates the termination of ocean dumping of sewage sludge by December 31, 1981. 40 CFR 228 lists the designated ocean areas where wastes may be disposed. Further, USEPA has published an annual report entitled "Ocean Dumping in the United States." This report includes information on permit holders, type of waste approved for disposal under the permit, and yearly waste volumes disposed.

USEPA has one designated deepwater disposal area in the Gulf of Mexico, as shown on Visual No. 11. Two smaller sites used for the dumping of liquid industrial wastes in the Gulf have been inactive for several years and their designation has lapsed. The large site in the Western Gulf is an incineration site for the burning of liquid chemical wastes, e.g., PCB, DDT, trichlorolethylene, etc. The permit has been redesignated and a second test burn was conducted in August 1982. Future burns, food or otherwise, will probably be deferred until promulgation of Ocean Incineration Regulations, a draft of which was published in the Federal Register on February 28, 1985 (50 FR 8221-8285). Individual permits for specific burns will also have to be issued by USEPA. For a discussion of these Gulf disposal sites, refer to Dumping Evaluation Report, 81-2, NOAA, Ocean Dumping Program.

The Department of Defense's (DOD) explosives dumping areas found in the Gulf planning areas are shown on Figure I-5. Most of the small areas contain a single, undetonated depth charge. For the eight large areas shown, dumping consisted of old ordnance and unexploded (duds) shells and depth charges. No dumping has taken place in any explosive areas since 1969-1970. However, all lessees should take precautions in drilling and locating structures within or near these areas due to the presence of unexploded ordnance. The U.S. Air Force (USAF) has released an indeterminable amount of unexploded ordnance in water test areas 1-5 as a result of testing and training missions. The exact locations of this unexploded ordnance cannot be determined and all lessess in the Gulf should take precautions in drilling or locating structures in these areas.

f. Dredge Material

The dredge is used exclusively for excavation in water. It is used to deepen channels, ports, and harbors and to provide fill material for construction of piers, wharves, docks, underwater foundations, dikes, levees, and related water management structures. Dredging occurs to maintain open channels, canals, and waterways and for the excavation of sand, shell, gravel, and other minerals. Permits issued by COE are required for work on structures in navigable waters of the United States, for the discharge of dredged material or fill into navigable waters, and for transportation of dredged material for the purpose of dumping into ocean waters. COE excercises regulatory authority in navigable waters primarily under the Rivers and Harbors Act of 1899 and the Federal Water Pollution Control Act of 1972. Dredge and fill regulations were revised in July 1975 to include nontidal wetlands. Permits are required by State and local governments, private operators, and other Federal agencies including the COE. Permit applications are evaluated to determine the benefits and/or detriments resulting from a proposed action. A permit is issued when it is determined by COE that the proposal is in the overall public interest.

g. National Defense

The U.S. Navy and Air Force actively use nine military warning areas and five water test areas in the Gulf of Mexico, as shown on Visual No. 11 and Figure I-5. Five of these warning areas lie in the CPA and WPA, and four of these warning areas and the five water test areas lie in the Eastern Gulf. Military operations within these warning areas vary in the types of missions performed and their frequency of use. Such missions include carrier maneuvers, missile testing, rocket firing, pilot training, air-to-air gunnery, air-to-surface gunnery, minesweeping operations, submarine operations, air combat maneuvers, aerobatic training, missile testing and development, and instrument training.

In the CPA, WPA, and Eastern Gulf, space-use conflicts will develop with increased USAF and Navy testing and training activities and unrestricted oil and gas development crucial to the Nation's economic and military security. DOI and DOD will work together to assure that Federal offshore development does not conflict with military training. Consultation will take place early and often in the two-year process leading to a lease sale to avoid conflicts and restrictions to the objectives of both departments.

Other general site-specific stipulations have been developed, as necessary, to avoid conflicts and, in irreconcilable cases, areas will be deferred from lease sales.

h. OCS Geothermal

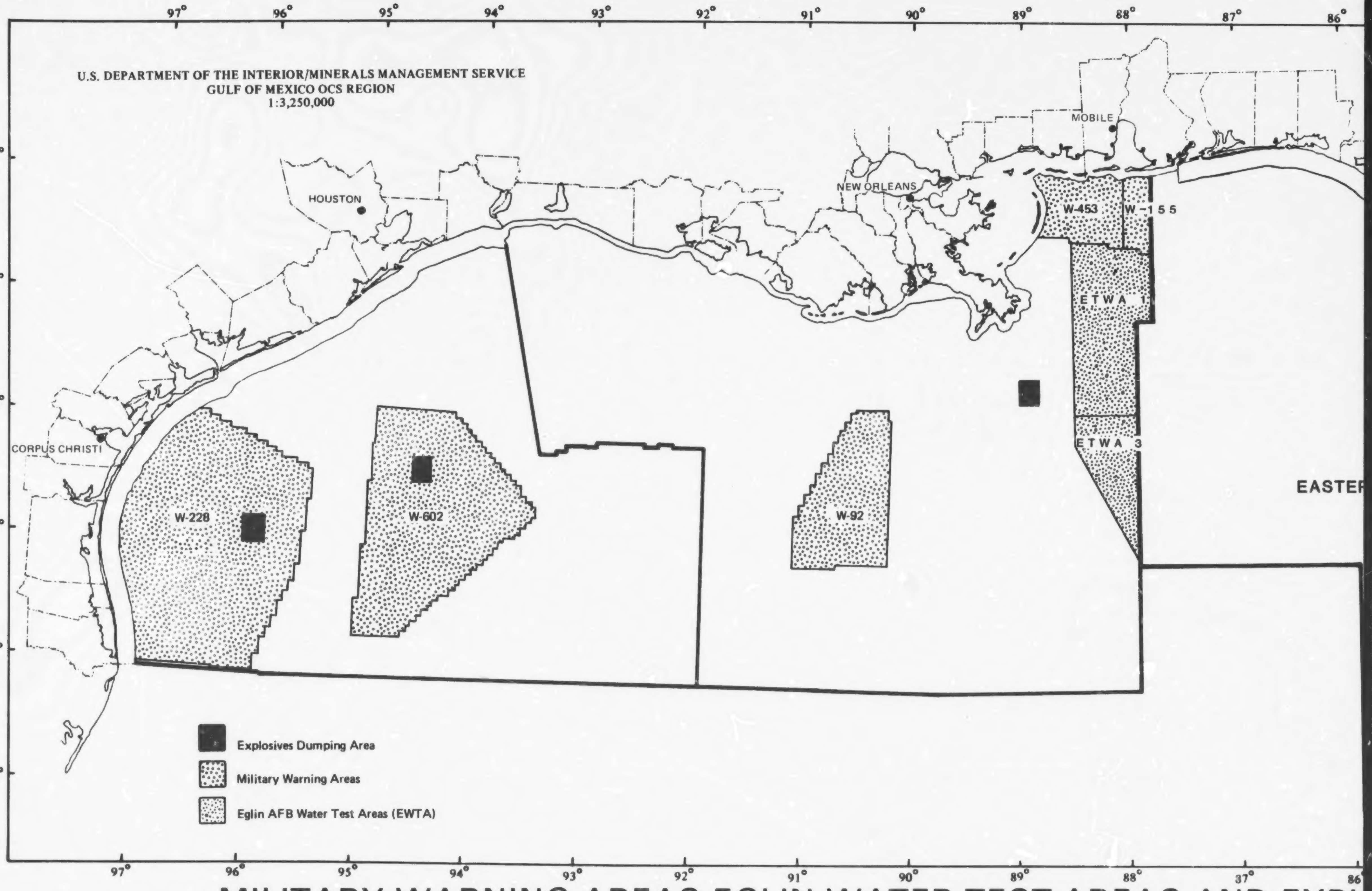
The petroleum crisis of 1973 caused an awakening in many countries for the need to evaluate and develop alternative energy sources. Consequently, during the past 10 years, geothermal exploration, utilization, and research have taken a dramatic upswing, both in the United States and throughout the world. This upswing in the United States has resulted in new information, improved exploration, extraction, and utilization technologies, and a greater understanding of resource characteristics.

Of the four categories of geothermal systems recognized, technology has not been developed to utilize the first two types which include magnetic and hot, dry rock systems. The third type, convective geothermal, is the only type now being commercially exploited. In convection systems, circulating fluids within a bounded reservoir transfer heat from a deep source to near the surface. Isotope ratios and trace element studies indicate the source of the convective water to be primarily meteoric. Rainwater percolates downward, presumably along fault planes, becomes heated, and where impermeable rock overlies the permeable reservoir, the escape of the water is prevented and a convective system is created. The fourth type of system consists of geopressured zones, which occur throughout the world in basins where rapid sedimentation and contemporaneous faulting are taking place and are characterized by abnormally high pressures and temperatures. The most understood and studied geopressured region in the world is the Gulf coast of the United States.

Geopressured-geothermal waters along the Texas and Louisiana Gulf coast contain three forms of energy capable of utilization through existing technology. This energy may be harnessed to produce heat or electric power, as well as feedstock for the chemical industry; however, as in the conversion of most types of potential energy to readily usable forms, special problems exist requiring some development work and unique solutions. The potential for economically extracting solution methane from water is one of the most attractive aspects of the offshore geopressured-geothermal prospects. Investigation of the technical and economic viability of producing water for methane extraction upon depletion of conventional oil and gas reservoirs is suggested as an alternative to the plugging of wells and removal of production platforms. Initial processing of this energy resource may most likely develop on land, but continued future development could proceed into OCS waters. For a more detailed discussion of OCS geothermal, refer to BLM Open File Report 81-01 (USDI, BLM, 1981).

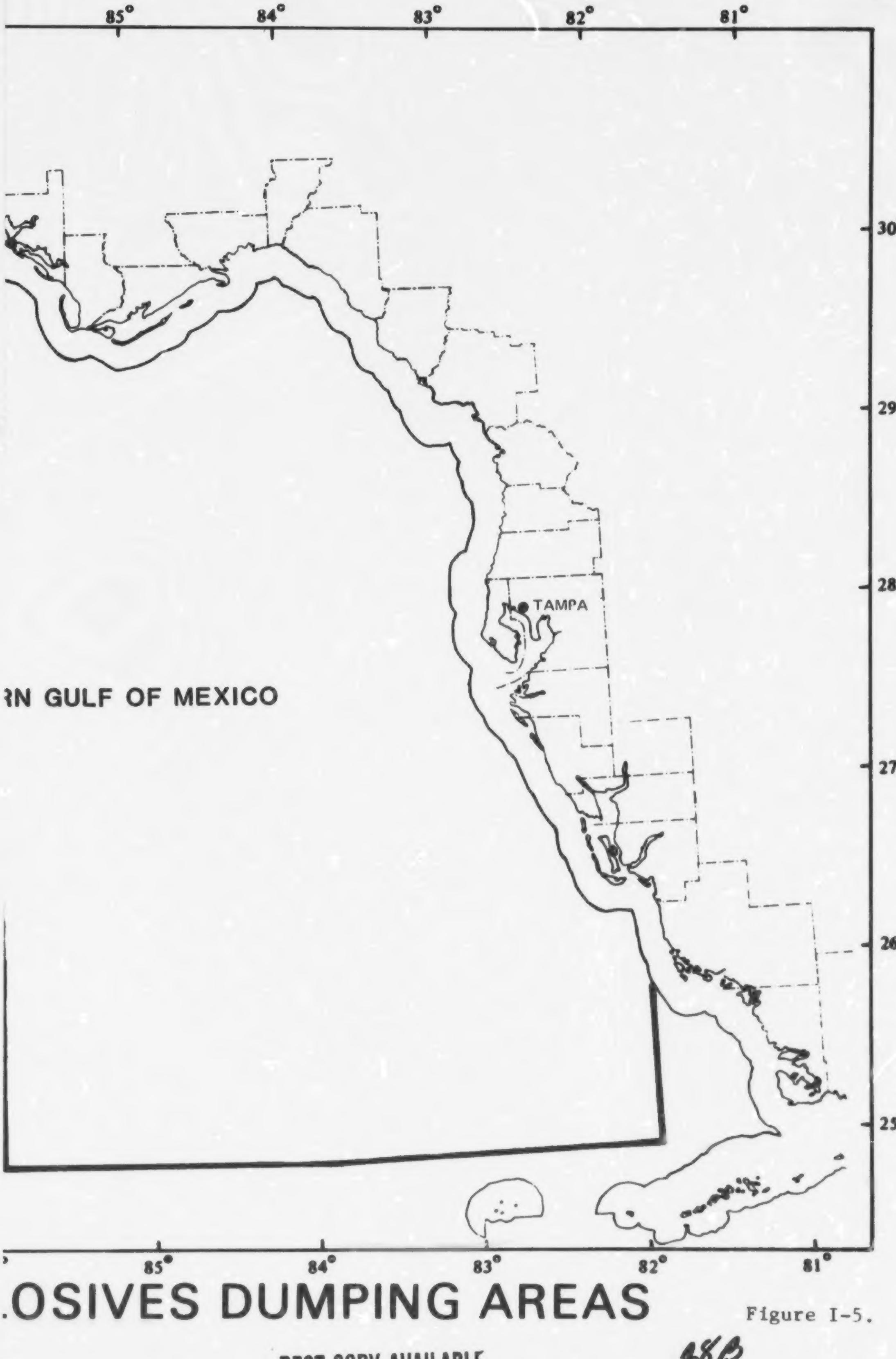
i. Strategic Petroleum Reserve

The 1973 petroleum embargo highlighted the perceived requirement for a petroleum reserve for the United States in the event of interruption of the flow of petroleum in the United States from any cause. This need was met with legislation in the Energy Policy and Conservation Act of 1975 (42 U.S.C. 6201 et seq.), which created the Strategic Petroleum Reserve (SPR), and also provided for the Early Storage Reserve, the Industrial Petroleum Reserve, and the Regional Petroleum Reserve.


U.S. DEPARTMENT OF THE INTERIOR/MINERALS MANAGEMENT SERVICE
GULF OF MEXICO OCS REGION
1:3,250,000
97°
96°
95°
94°
93°
92°
91°
90°
89°
88°
87°
86°
30°
29°
28°
27°
26°
25°
HOUSTON
NEW ORLEANS
MOBILE
CORPUS CHRISTI
W-453
W-155
ETWA 1
ETWA 3
W-228
W-602
W-92
EASTER
Explosives Dumping Area
Military Warning Areas
Eglin AFB Water Test Areas (EWTA)
37°

MILITARY WARNING AREAS, EGLIN WATER TEST AREAS AND EXPL

28A


85°
84°
83°
82°
81°
30°
29°
28°
TAMPA
RN GULF OF MEXICO
27°
26°
25°
85°
84°
83°
82°
81°

.OSIVES DUMPING AREAS

Figure I-5.

BEST COPY AVAILABLE

The Energy Policy and Conservation Act provided for the amount of the reserve to equal the total volume of oil imported over a three consecutive month period in 1974-1975 during which average monthly import levels were highest. Based on imports in these months, the SPR Plan recommended a Reserve size of 500 million barrels (MMB). The plan stated that if subsequent estimates of national vulnerability showed a need for a larger or smaller Reserve, this requirement would be presented to the Congress as a Plan Amendment.

Based on recent vulnerability assessments, prudence dictates that this country prepare to deal with the possibility of another such interruption. Therefore, SPR Plan Amendment No. 2 increased the size of the SPR to 1,000 MMB. To date, the SPR program has been organized into three major phases consisting of: (1) Phase I which consists of development of the initial 248 MMB in existing underground capacity available at five salt domes in Texas and Louisiana; (2) Phase II consists of the 290 MMB expansion of existing underground storage capacity, increasing SPR's capacity to 538 MMB; and (3) Phase III which represents expansion of SPR storage capacity by 212 MMB to achieve a 750 MMB reserve by 1989 (US, DOE, 1981).

7. Gulf of Mexico Regional Environmental Studies Program

MMS supports and administers a large, multidisciplinary studies program to develop information needed for assessment and mitigation of impacts to marine and coastal environments which may be affected by OCS oil and gas activities. This program was initiated in 1973 with award of contracts for collection and synthesis of environmental and socioeconomic information, and was developed to include major field studies in 1974 and subsequent years. During the period of 1974-1978, the program consisted largely of baseline studies in the South Texas and Eastern Gulf of Mexico (MAFLA) areas, plus "special studies" of numerous offshore submarine banks of the Texas/Louisiana continental shelf. The baseline studies approach was abandoned in late 1978, and the program was reoriented to include a wide variety of study approaches. A detailed description of the program's history, objectives, and present composition is presented in Volume 1, Section I.B.7. of the Final Regional EIS; study areas for the various field studies are portrayed on Visual No. 5.

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SECTION II

ALTERNATIVES INCLUDING THE PROPOSED ACTIONS

II

II. ALTERNATIVES INCLUDING THE PROPOSED ACTIONS

A. CENTRAL GULF SALE 104

1. Alternative A - The Proposed Action

a. Description of the Proposed Action

The proposed action is the offering for lease of all unleased blocks within the CPA (Figure I-1). It is noted that the area in Mississippi Sound formerly referred to as the "Federal enclaves" is no longer included in the CPA (Section I.B.2.c.). Biological, cultural resources, and military area stipulations are included as part of the proposed action as mitigating measures. The proposed action is consistent with the areawide approach to sales based on geologically favorable areas, the rationale for which is described in detail in the Final Supplement to the Final Environmental Statement for the Proposed Five-Year OCS Oil and Gas Lease Sale Schedule (USDI, BLM, 1982).

The proposed action is scheduled for April 1986. The unleased area available for leasing was 33.1 million acres on 6,167 blocks as of December 1984. However, this amount will be modified somewhat as a net result of proposed Sale 98 (May 1985) leasing and the relinquishment of existing leases in the coming months. Unleased blocks are located from approximately 3-220 miles offshore in water depths ranging from approximately 4 m to over 3,200 m. The estimated amounts of hydrocarbon resources to be discovered and produced (recovered) as a result of the proposed action are 0.15 billion barrels of oil and 1.23 tcf of gas.

The analysis of impacts summarized below and described in detail in Section IV.D.1.a. is based on a development scenario (Most Likely Find or M Scenario) formulated to provide a set of assumptions and estimates on the amounts, locations, and timing for OCS exploration, development, and production operations and facilities, both offshore and onshore. A detailed discussion of the M Scenario and major related impact producing factors is included in Sections IV.A. and IV.B. Table II-1 summarizes major elements of the M Scenario and related impact producing factors for the proposed action. Besides the oil and gas recovery estimates cited above, the following major assumptions and estimates were considered in the impact analyses for the proposed action:

- The drilling of 360 exploration and delineation wells during the period 1987-1997.

- The installation of 20 production platforms and the drilling of 200 production wells during the period 1988-1999.

- Oil and gas production beginning in 1988 and reaching peak annual production in 1995 for oil (18 million bbls) and in 1996 for gas (148 billion cubic feet).

- Estimated drilling mud solid discharges of 1.64 million bbls and estimated drill cutting discharges of 0.18 million cubic yards.

- Hydrocarbon production transported by pipeline to onshore processing facilities in the central coastal area.

- The construction of 220 miles of offshore pipeline and up to three new transmission pipeline landfalls with up to 60 miles of onshore routing.

- Onshore support activities being provided from existing locations and facilities in Louisiana, Mississippi, Alabama, and Texas, with possibly one new service base for development/production operations. Likely potential locations for a new service base (which could use up to 75 acres) include Harrison and Jackson Counties in Mississippi and Mobile County in Alabama.

Table II-1

Summary - Major Elements of the M Scenario and Related Impact Producing Factors for the Proposed Action Central Gulf Sale 104

Resources Expected to be Developed[1]	
Oil (billion bbls)	0.15
Gas (tcf)	1.23
Offshore Infrastructure	
Exploration and Delineation Wells Drilled	360
Production Platforms Installed	20
Production Wells Drilled	200
Pipeline (miles constructed)[2]	220
Offshore Discharges[3]	
Drilling Mud Material (million bbls)	1.64
Drill Cuttings (million cubic yards)	0.18
Formation Waters (billion bbls)	0.0015-0.135
Offshore Air Emissions (peak year - 1,000 tons)	
NO_x	4.13
CO	0.67
SO_x	0.08
VOC	0.94
TSP	0.01
New Onshore Facilities[4]	
Service Bases	1
Pipeline Landfalls	3
Pipeline (miles constructed)	60
New Resident Population (1,000)[5]	1.1
Transportation Vessel Traffic[6]	9,600
Transportation Helicopter Traffic[6]	18,980
Oil Spill Contacts[7]	
Large Spills (≧ 1,000 bbls)	1
Medium Spills (50-999 bbls)	1
Small Spills (1-49 bbls)	15

[1] Estimates of oil and gas expected to be discovered and produced as a result of the proposed action.

[2] Gathering and transmission pipelines.

[3] Total amount related to the exploration and development activity.

[4] Maximum number in expected range. See Table IV-6 for location by coastal subarea. See Table IV-49 for estimated acreage used for each type of facility.

[5] Maximum (peak year) level.

[6] Number of trips (outbound plus inbound) for peak year activity.

[7] Assumed number of oil spills occurring and contacting coastal land segments within 10 days for large and medium spills and within 3 days for small spills. Spills assumed to occur during the 18-year production period (1988-2005). The average size of a large spill is estimated at about 17 thousand bbls based on historic statistics.

- A total of one large oil spill within 10 days (1,000 bbls or greater) is assumed to occur and contact land as a result of the proposed action. The impact of this spill contact is considered for each land segment having a 1% or greater chance of being contacted (within 10 days) by a spill occurring as a result of the proposed action (Cameron, Vermilion, Iberia, Terrebonne, Lafourche, Jefferson, Plaquemines, and St. Bernard/Orleans/St. Tammany Parishes). It is noted that the oil spill risk analysis estimates that there is an 18% chance of one or more spill contacts with land as a result of the proposed action. Section IV.A.5. discusses the oil spill contact assumptions in more detail.

b. Summary of Impacts

The following are summaries of the detailed impact analyses of the proposed action which are included in Section IV.D.1.a. It is noted that these summaries are limited to the impact of the proposed action alone (under the M Scenario); the cumulative impacts which are discussed in Section IV.D.1.a. are not summarized here. Table S-3 indicates the level of impact on each resource category estimated as a result of the proposed action and the cumulative factors.

Five levels of impact are defined for each impact topic and used in the conclusion to indicate the degree of intensity or severity of the impact. The five levels are designated by the following qualitative degrees of impact: very high; high; moderate; low; and very low. Definitions of these impact levels for each resource category are defined in Table S-4.

To facilitate the analysis the Federal offshore area is divided into subplanning areas (the Central Planning Area is comprised of four subplanning areas: C-1, C-2, C-3, and C-4). In addition, the coastal region is divided into coastal subareas (the Central Coastal Area is comprised of four coastal subareas: C-1, C-2, C-3, and C-4). These subareas are delineated on Figure IV-1.

(1) Impacts on Sensitive Coastal Habitats (Wetlands)

The construction of up to three new pipelines and up to one service base as a result of the proposed action could cause destruction, alteration, or interference with sensitive coastal habitats in the following amounts: up to 180 acres in coastal subarea C-1; up to 168 acres in coastal subarea C-2; up to 204 acres in coastal subarea C-3; and up to 75 acres in coastal subarea C-4. In addition, one large (1,000 bbls or greater) and several smaller oil spill contacts with sensitive coastal habitats are assumed. Such contacts are expected to cause moderate or high impacts depending on the specific habitats contacted. The expected levels of impact on sensitive coastal habitats are estimated to be moderate in coastal subarea C-1, high in coastal subareas C-2 and C-3, and low in coastal subarea C-4.

(2) Impacts on Sensitive Offshore Habitats

As described in Section IV.D.1.a.(2), the major potential impact producing factors that could affect live bottom areas and biologically sensitive areas of topographic features in the Central Gulf are mechanical damage due to anchors, drilling, pipelines, platform emplacement, smothering, and blowouts, and toxicity of the drilling fluids. Oil and gas operations resulting from this proposal could cause very high and potentially long-lasting damage due to the relatively small coral and coral community areas of the Gulf if unrestricted operations take place on or near these important sensitive habitats. High deleterious impacts to fish habitats of the topographic features and live bottoms may also affect the recreational and commercial fisheries of the area, and the intrinsic biological, ecological, and aesthetic values of these areas might be seriously diminished.

However, the stipulations described in Section II.A.1.c.(1) and (2) (which is included as part of the proposed action) will mitigate all or nearly all of these adverse impacts (except for rare catastrophic accidents) without reducing the amount of oil and gas resources that could be recovered, resulting in a very low expected impact level to these sensitive offshore habitats.

The two stipulations have been developed during the past 11 years to protect biological resources of the Central Gulf of Mexico. One is the Live Bottom Stipulation, and the other is the Topographic Features Stipulation. Both are included as part of the proposed action.

(3) Impacts on Water Quality

(a) Offshore

As a result of Sale 104, localized offshore water quality degradation will occur in the CPA. Immediate impacts would be brought on by increased drilling of up to 360 exploration and delineation wells, construction, and pipelaying activities resulting in laying up to 220 miles of pipeline. Other impacts would stem from additional dredging activities, and discharges of drilling muds, fluids, cuttings, sanitary and domestic wastes, and formation waters from the 20 platforms projected for this area. The expected impacts are estimated to be high around platforms and construction sites depending on existing local water conditions, with the extent of such impacts extending from only a few meters to tens of meters from these sites. These impacts will decrease to very low with distance (500-1,000 m) from the source. The overall impact to offshore water quality is estimated to be low.

(b) Onshore

Onshore water quality degradation will occur as a result of increased nonpoint and point sources of pollution, especially in those areas of Louisiana (Calcasieu Basin, Mississippi Delta), Mississippi (Pascagoula area), and Alabama (Mobile Bay) where water quality problems already exist. Any increased point source impacts from a new service base in coastal subarea C-4 can be mitigated by Federal and State regulations and guidelines. Nonpoint source impacts may be minimized by controlling erosional effects generated within all construction site boundaries, especially with regards to the up to 60 miles of onshore pipeline projected for coastal subareas C-1 (up to 20), C-2 (up to 20), and C-3 (up to 20); therefore, expected impacts to onshore water quality would be low.

(4) Impacts on Air Quality

Activities resulting from Sale 104 are expected to impact air quality from catastrophic events (blowouts and oil spills), offshore operational emissions from drilling, platform installation, and production. Additional gas processing or refining capability is not expected to be needed as a result of this lease sale. Impacts resulting in slight increases of some criteria pollutants are assumed to be felt in areas classified as nonattainment or Prevention of Significant Deterioration (PSD) Class I areas that may be adjacent to more dense OCS-related activities, i.e., Mobile County in Alabama, and St. Bernard, Plaquemines, St. Mary, Lafourche, St. Charles, Jefferson, Orleans, and St. John the Baptist Parishes in Louisiana. Coastal air quality could deteriorate if an unflared blowout causes the uncontrolled release of sour gas into the atmosphere within 3-5 miles of shore. The expected levels of OCS-related activities (20 platforms and no new gas processing or refining facilities) should cause little long term degradation of ambient air quality with no significant effects on nonattainment or PSD areas. (For a detailed analysis, see Section IV.D.2.a.(4).) Short-term degradation of air quality could occur as a result of uncontrolled release of sour gas from a blowout. Moderate impacts are expected in St. Bernard, Plaquemines, St. Mary, Lafourche, St. Charles, Jefferson, Orleans, and St. John the Baptist Parishes in Louisiana and in Mobile County in Alabama. Very low impacts are expected throughout the remainder of the coastal area of the Central Gulf.

(5) Impacts on Endangered and Threatened Species

The impact producing factors which could affect endangered and threatened species as a result of the proposed action include oil spills, collision with support vessels, and disturbance from offshore and onshore activities. One large (1,000 bbls or greater) and several smaller oil spill contacts with endangered and threatened species habitats are assumed.

(a) Sea Turtles

Oil spill contacts are expected to have a very low impact on sea turtles depending on the specific habitat affected. Offshore support vessel traffic into Louisiana ports is estimated to increase less than 3% and is not likely to impact sea turtles. One potential onshore service base in Jackson County, Mississippi, or Mobile County, Alabama, and three potential pipeline sites in Louisiana are unlikely to affect sea turtles or their habitats in these areas. The overall expected level of impact on sea turtles is estimated to be very low depending on the specific habitats affected.

(b) Brown Pelicans

Oil spill contacts are expected to have a very low impact on brown pelicans depending on the specific habitat affected. One potential onshore service base in Jackson County, Mississippi; or Mobile County, Alabama, and three potential pipeline sites in Louisiana are unlikely to affect brown pelicans or their habitats in these areas. The overall expected level of impact on brown pelicans is estimated to be very low depending on the specific habitats affected.

(6) Impacts on Marine Mammals

The impact producing factors which could affect marine mammals as a result of the proposed action include oil spills, collision with offshore support vessels, and disturbance from offshore activities. One large (1,000 bbls or greater) and several smaller oil spill contacts with marine mammal habitats are assumed. Such spill contacts are expected to cause a very low level of impact. Offshore support vessel traffic is estimated to increase less than 3% in this coastal area and is not likely to impact marine mammals. The disturbance and noise associated with seismic exploration and drilling about 560 wells will be short-term and localized near drilling sites. The overall expected level of impact on marine mammals is estimated to be very low.

(7) Impacts on Coastal and Marine Birds

The impact producing factors which could affect coastal and marine birds as a result of the proposed action include oil spills and disturbance from onshore construction. One large (1,000 bbls or greater) and several smaller oil spill contacts with nesting and/or feeding areas is assumed. Such spill contacts are expected to cause a low level of impact. One potential service base requiring a total of 75 acres in the Jackson County, Mississippi, and/or Mobile County, Alabama, and three potential pipeline sites requiring about 840 acres in Louisiana are unlikely to affect coastal and marine birds and their habitats in these areas as construction sites must be approved by Federal, State, and local agencies. The overall expected level of impact on coastal and marine birds is estimated to be low.

(8) Impacts on the Commercial Fishing Industry

Several impact producing factors from this alternative could affect the commercial fishing industry, including loss of fishing area through construction of platforms/structures, gear conflicts, and an assumed spill of 1,000 bbls. As a result of these impact producing factors, a moderate impact (a 1% or less economic loss to the commercial fishing industry, some financial loss to the fishermen, and secondary employment affected) could occur to the commercial fishing industry.

(9) Impacts on Offshore Marine Recreational Fishing

Thirty years of offshore leasing in the Central Gulf has had a high to very high positive impact on the focus, amount, and success of offshore marine recreational fishing. It is estimated that over 40% of the offshore recreational fishing participation, effort, and catch throughout the 46 million acres of the CPA is directly associated with the more than 3,600 existing oil and gas structures. The 20 new platforms likely to result in the Central Gulf from 1986 lease sales will also function as high profile artificial reefs and greatly improve fishing prospects in their vicinity. The incremental effect on overall recreational fishing is likely to be low unless one or more of these 20 structures becomes unique because of its specific siting or ability to attract and concentrate desired sports fishing targets. Oil spills will temporarily (a day or two) remove the affected area (slick area) from sports fishing activity but is unlikely to cause a detectable decline in the overall quantity or quality of marine recreational fishing. The proposed action is expected to have a very low positive impact on marine recreational fishing in the Central Gulf of Mexico.

(10) Impacts on Major Shorefront Recreational Beaches

One large (1,000 bbls or greater) and several smaller oil spill contacts are assumed with major recreational beaches in Louisiana. Such spill contacts are expected to have a low level of impact. In addition, residuals such as tar balls and trash associated with offshore operations will intermittently wash ashore and add to the existing trash and debris problems associated with Gulf of Mexico beaches, causing localized, short-term inconveniences. The overall level of expected impact on major recreational beaches is estimated to be low.

(11) Impacts on Cultural Resources

(a) Historic

The impact producing factors which could affect offshore and onshore historic cultural resources include interactions with drilling rigs, platforms, pipelines, anchors, construction of onshore facilities, and contact by spilled oil. The impact levels to historic sites, should an interaction occur with an impact producing factor, range from low to very high depending on the type of interaction and the uniqueness of the data lost as a result of the interaction. However, the risk of these impacts occurring is low with the exception of impacts from offshore development in the eastern portion of the Central Gulf, which is assessed as being moderate. Considering the range of impact levels and the risk, the expected impact to historic sites in the Central Gulf as a result of the proposed action is moderate.

(b) Prehistoric

The impact producing factors which could affect offshore and onshore prehistoric cultural resources are the same as those listed above for historic resources. The impact levels to prehistoric sites, should an interaction occur with an impact producing factor, range from moderate to very high depending on the type of interaction and the uniqueness of the data lost as a result of the interaction. However, the risk of any of these impacts occurring is low. Considering the range of impact levels and the risk, the expected impact to prehistoric sites in the Central Gulf as a result of the proposed action is moderate.

(12) Impacts on Tourist Activity/Industry

One large oil spill contact (1,000 bbls or greater) with a major recreational beach important to the tourist industry is assumed. Such a spill could occur with one of two land segments along the Louisiana coast, either in Cameron or Jefferson Parish, Louisiana. In these parishes, the amount of tourism that is related to beach use is very low. A spill contact with the recreational beaches in these parishes could cause tourism losses as follows: Cameron - $0.006 million and Jefferson - $1.48 million. This effect on tourism expenditures would amount to losses of only 0.125% for Cameron or 0.5% for Jefferson Parish. The maximum loss would be less than 1% for the potentially affected area. Therefore, the net effect on tourism expenditures would be very low.

(13) Impacts on Military Use/Warning Areas

As a result of the proposed action, the major potential impacts identified in Section IV.D.1.a.(13) are the number and the locations of rigs and platforms, and the number of service vessels and helicopters crossing the military warning areas. The impact of the number of exploration rigs and platforms on ship maneuvers and aircraft missions is expected to be low. The greatest number of exploration rigs in the peak year (1991) is projected to be 2-3 and they are distributed among warning areas W-453, W-155, and W-92. The increase over past activity is low, and there has been very little conflict and no reported impact of present activities on military use. The 2-3 platforms resulting from Sale 104 are expected to be scattered within the warning areas, and the impacts from these locations on ship maneuvers and aircraft missions should be low within W-453 and W-92, but the locations of any rigs and platforms in W-155 could affect carrier operations.

In consideration of the location of the potential resources indicated in Visual No. 13, the trend is projected for exploration and development facilities to locate in the high resource potential areas, leaving the remaining areas of deeper water and moderate resource potential open. The number of service vessels and helicopter flights resulting from oil and gas activity from Sale 104 is expected to produce a low impact on military use of the warning areas. The increases in traffic are expected to be no greater than the increases resulting from previous lease sales, and the oil- and gas-related traffic assumes only a 30%-50% increase of the total increase of the traffic to be passing through each warning area. The proposed action is expected to have a low level of impact on warning areas W-92 and W-453, and a high level of impact on warning area W-155.

The stipulation that is part of the proposed action will mitigate the impact of oil and gas related traffic, but it will not reduce the impact of other potential conflicts, such as the locations and numbers of exploratory rigs and production platforms (for stipulation see Section II.A.1.c.(4).

(14) Impacts on Water Supply

As a result of Sale 104, increased demands on coastal water resources may be expected tc occur from increased OCS activities in the CPA. Existing water supplies would be impacted due to localized population increases and increased demands of freshwater for industrial processes initiated by onshore support facilities, primarily the 0-1 new service base projected for the C-4 coastal subarea. Impacts at each location will vary in degree, depending on existing water resources. Since there is an abundance of surface and ground water resources in the region due to rain surpluses, this alternative is expected to cause a very low impact on regional water supplies.

(15) Impacts on Local Employment, Income, and Population

The impact on local employment, income, and population due to proposed Sale 104 is expected to occur throughout the Louisiana coastal region over a 20-year period (1987-2006). Most of the employment generated by the proposed sale would allow a continuation of employment generated by previous Central Gulf OCS lease sales, primarily Sales 72, 81, and 98, to existing residents.

However, a small percentage of this employment is expected to attract new residents into the region. This new resident employment of about 470 jobs with a payroll of about $11.2 million (averaging $23,900 per employee) will require a population influx of 1,081. These growths in employment, payroll, and population will occur in 1987 and will be less than 1% of the total Central Gulf region's employment, payroll, and population in that year. Therefore, the impact on employment, payroll, and population is expected to be very low in all four Central coastal subareas due to Sale 104-induced increases.

(16) Impacts on Community Infrastructure

The proposed sale is estimated to generate a population growth of 1.1 thousand persons distributed over 26 parishes/counties in coastal subareas C-1, C-2, C-3, and C-4. These new residents will impact community infrastructure through increased demand for, and use of, commonly provided public, semi-public, and private services and facilities. Section IV.D.2.a.(16) lists the typical impacts of population growth on community services and facilities. Such increases could cause reductions in the quality of services and other adverse effects. However, the estimated average annual population increase is 100 persons or less, and the average annual growth rates are 0.1% or less for all the potentially affected parishes/counties. These amounts of population growth and related increases in the demand for, and use of, community services and facilities indicate a very low level of expected impact, i.e., negligible to minor adverse effects on the quality of community infrastructure.

(17) Impacts on State and Local Land Use Management

Analysis of the activities/facilities estimated to result from the proposed action (M Scenario) and the Louisiana, Mississippi, and Alabama CZM programs and local land use policies indicates that potential incompatibilities or conflicts can be avoided or effectively mitigated. A number of mitigating measures are incorporated into the Federal regulatory mechanisms governing the proposed lease sales which provide effective control over effects addressed by the CZM programs. In addition, postsale proposals to use specific sites must go through necessary Federal, State, and local review and permitting procedures. On the basis of this analysis, it is considered likely that the estimated OCS-related activities/facilities can be designed, located, constructed, and operated in a manner such that the expected level of impact on state and local land use management policies would be very low.

(18) Impacts on Ports and Marine Transportation

As a result of the proposed action, vessel traffic is expected to increase by about 6% in subarea C-1, 7% in C-2, 3% in C-3, and less than 1% in C-4 in the peak year of activity (1991). The development of infrastructure associated with the proposed action is expected to result in the emplacement of 20 additional fixed structures: five in C-1; nine in C-2; five in C-3; and one in C-4. The impacts on the demand for port and harbor facilities and on the likelihood of conflicts between vessels and vessels and vessels and structures resulting from the proposed action are expected to be moderate in subareas C-1 and C-2, low in C-3, and very low in C-4.

c. Stipulations Included in the Proposed Action

(1) Live Bottom Stipulation

There is a small area in the extreme northeast portion of the CPA consisting of the Mobile leasing area and that part of the Viosca Knoll leasing area which is north of Main Pass Area, South and East Addition, which might contain live bottom areas. A "live bottom" stipulation has been made a part of previously issued leases in the Eastern Gulf and is currently a part of many active leases in the Eastern Gulf. It should be noted that this stipulation will not prevent the recovery of oil and gas resources, but it will serve to protect valuable and sensitive biological resources. The area affected by the stipulation option is shown in Figure II-1.

The stipulation would read as follows:

Live Bottom Stipulation
(Central Planning Area)

(To be included only in leases on blocks in the Mobile leasing area and that part of the Viosca Knoll leasing area north of Main Pass Area, South and East Addition.)

Prior to any drilling activity or the construction or placement of any structure for exploration or development on this lease, including, but not limited to, well drilling and pipeline and platform placement, the lessee will submit to the Regional Director (ORD) a bathymetry map prepared utilizing remote sensing and/or other survey techniques. This map will include interpretations for the presence of live bottom areas within a minimum of 1,820 m radius of a proposed exploration or production activity site.

For the purpose of this stipulation, "live bottom areas" are defined as seagrass communities; or those areas which contain biological assemblages consisting of such sessile invertebrates as sea fans, sea whips, hydroids, anemones, ascidians, sponges, bryozoans, or corals living upon and attached to naturally occurring hard or rocky formations with rough, broken, or smooth topography; or areas whose lithotope favors the accumulation of turtles, fishes, and other fauna.

If it is determined that the remote sensing data indicate the presence of hard or live bottom areas, the lessee will also submit to the ORD photo-documentation of the sea bottom within 1,820 m of the proposed exploration drilling sites or proposed platform locations.

If it is determined that the live bottom areas might be adversely impacted by the proposed activity, then the ORD will require the lessee to undertake any measure deemed economically, environmentally, and technically feasible to protect live bottom areas. These measures may include, but are not limited to, the following:

(a) the relocation of operations to avoid live bottom areas;

(b) the shunting of all drilling fluids and cuttings in such a manner as to avoid live bottom areas;

(c) the transportation of drilling fluids and cuttings to approved disposal sites; and

(d) the monitoring of live bottom areas to assess the adequacy of any mitigation measures taken and the impact of lessee initiated activities.

Effect of the Lease Stipulation

Guidance for the proper implementation of the photodocumentation provision of this stipulation is printed in Section II.A.1.c.(1) of Final EIS 94/98/102.

The wording of the stipulation was developed in consultation with FWS, USGS, and the affected states. It has been in place on leases in the Eastern Gulf for over eight years and is also in place on active leases in the South Atlantic area. The evidence of monitoring reports in the South Atlantic and Environmental Reports (which contain any required live bottom surveys) in the

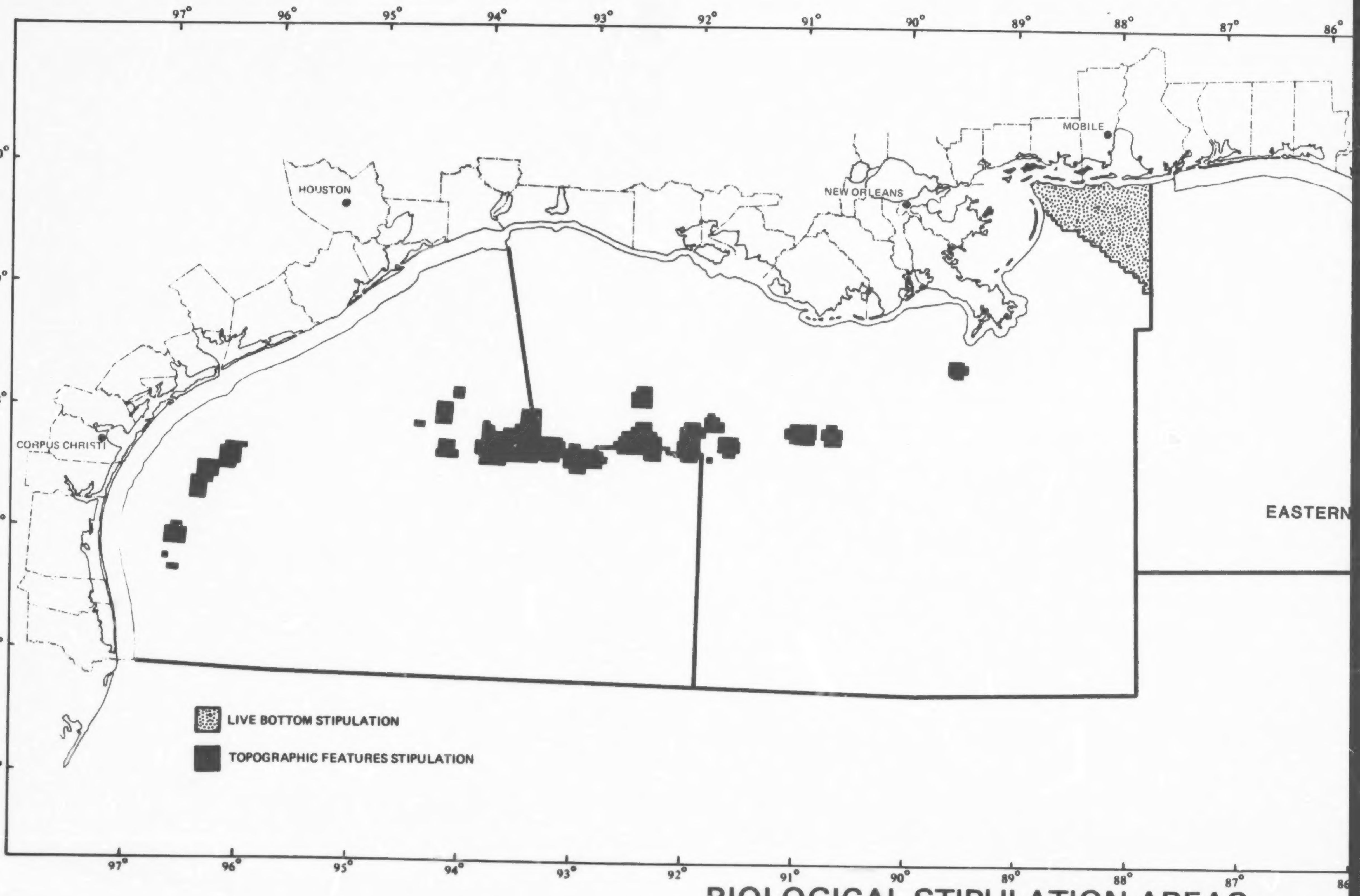
Eastern Gulf supports the contention that this stipulation is working to identify and protect live bottom areas. Absent this stipulation, live bottom areas could be undetected and may be seriously damaged by oil and gas exploration and development activities.

This stipulation has been deemed necessary in the past by the Secretary since the sensitive and high value live bottom areas are poorly known, low-relief (or no relief), patchy, scattered, and unmapped.

This stipulation will be applied to any leases resulting from this proposal for blocks in the Mobile leasing area and the northern part (north of Main Pass Area, South and East Addition) of the Viosca Knoll leasing area only.

Since live bottom areas (Section III.B.2.) are poorly mapped and apparently randomly scattered on the shelf off Alabama and Mississippi, the Live Bottom Stipulation would require an interpretation for and the identification of live bottom areas where it is believed such areas may exist. The stipulation would: (a) require the interpretation for and identification of potential live bottoms in the Mobile and the northern part of the Viosca Knoll Areas; (b) require photodocumentation for any potential live bottom areas identified in (a) above; and (c) provide for protective measures to be taken if live bottom areas are discovered within 1 nmi of the well site. The provisions of this stipulation were developed by DOI in consultation with the affected states which have expressed great concern about the potential damage that oil and gas operations may cause to valuable live bottom areas. Live bottom areas are considered important as commercial fish habitat, as recreational fishing and diving areas, and for their intrinsic value as beautiful coral and tropical biota habitat. If live bottom areas are identified near where drilling is to take place, several remedies are available to DOI for protecting the live bottoms, such as requiring the well location to be moved away from live bottom areas, disposal of drilling fluids and cuttings away from the area, or monitoring the impact of the drilling operations on the biota of the nearby live bottom. The ability of geophysical technology and photographs, which would be required by the stipulation, to locate live bottom areas have been amply demonstrated on previously issued leases in both the Eastern Gulf and the South Atlantic leasing areas. The avoidance of a live bottom area will, of course, protect it from mechanical damage. Monitoring the impacts of nearby oil and gas activities on the biota of a live bottom will add to our knowledge of such impacts; if any impacts are detected by the monitoring program, other protective measures may be instituted, including moving the activity further away from the live bottom. Shunting all drilling effluents to close to the bottom is effective in areas of relatively high relief (greater than 15 m) since the shunting will put any potentially harmful effluents in the bottom boundary layer, preventing them from reaching the level of the biota that is being protected (Bright and Rezak, 1981); but shunting near areas of low relief is probably counterproductive since it would put the effluents in the same water layer as the biota of concern. Barging of the effluents away from the live bottom area is considered a method to be used only if there is no other effective method available, not only because barging creates new problems of where to dispose of the material, but also because it would not be wise to have a barge load of potentially harmful material located over an area one wants to protect when a storm comes through the area. The capsizing or sinking of such a loaded barge could do far more damage to a live bottom area by dumping a large amount of the material on the live bottom than the slower, intermittent normal surface discharge would. In any event, the decision of which method of protection to be used would be made by the ORD in consultation with the FWS and the appropriate state(s). This "live bottom stipulation" is a part of all currently active leases in the Eastern Gulf in water depths of 100 m or less and is in many leases in water depths up to 200 m. Experience with the stipulation to date shows that it is indeed working to identify and protect live bottom areas. Furthermore, any oil and gas resources presently under such live bottom areas could be recovered using directional drilling techniques.

Use of this stipulation would reduce the potential impact of the proposed action on the live bottom areas of the Central Gulf from very high to very low by requiring the positive identification of live bottom areas (including seagrass areas) prior to any drilling activity, thus allowing the ORD to take effective action on a case-by-case basis to protect the identified live bottom area. Since live bottom areas vary in their productivity, biomass, diverseness, and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NEW ORLEANS
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EASTERN
▨ LIVE BOTTOM STIPULATION
■ TOPOGRAPHIC FEATURES STIPULATION

BIOLOGICAL STIPULATION AREAS

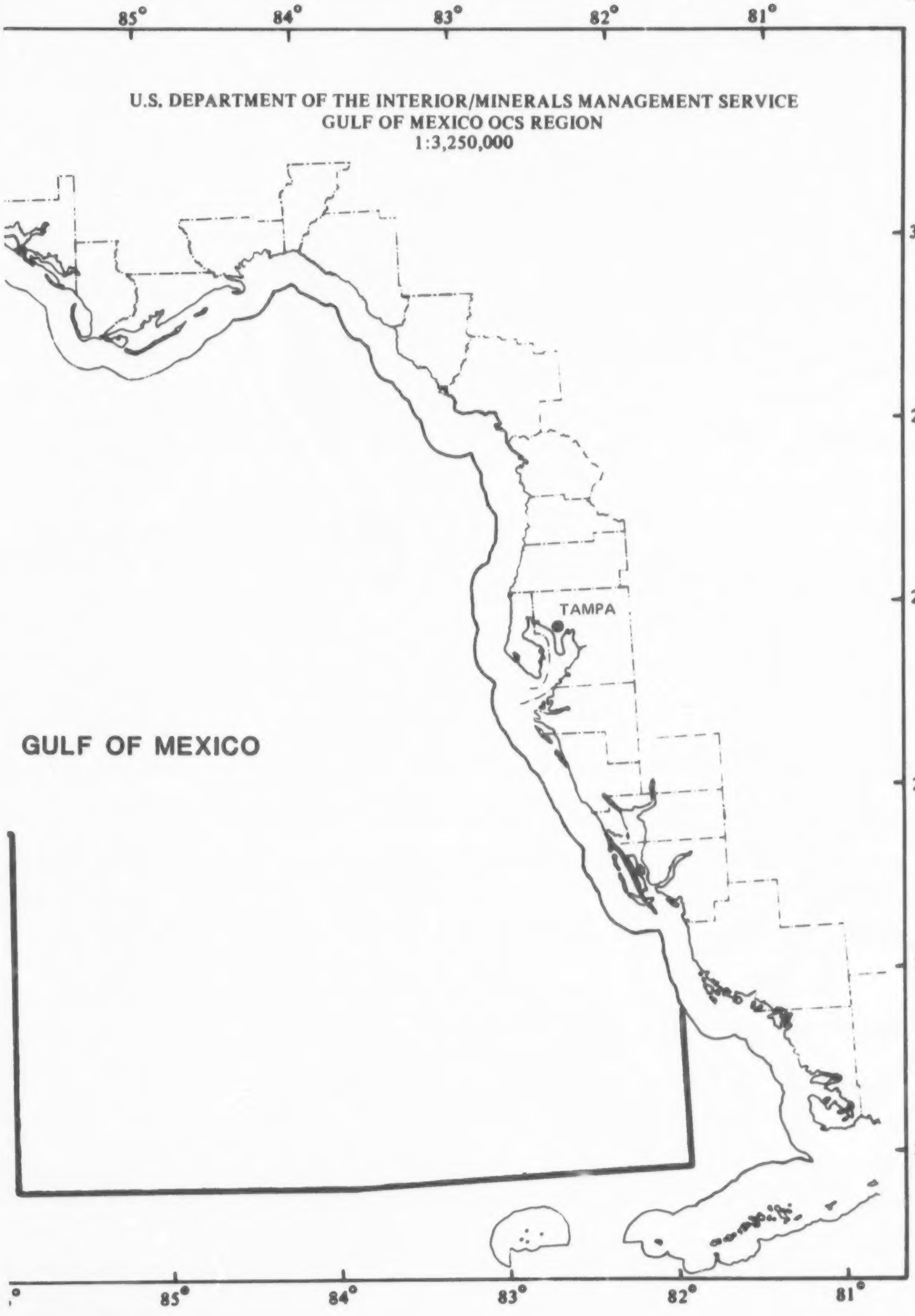
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Figure II-1

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uniqueness, so will the protective measures vary. Prudent management and consultation with other interested parties, such as FWS and the affected states, in evaluating the presence of live bottom areas will ensure that such areas receive necessary and sufficient protection from the impacts of nearby oil and gas operations. Experience with this stipulation on existing leases in the Eastern and Central Gulf has shown it to be an effective protective device for the biota of live bottom areas.

In conclusion, use of this biological stipulation for the appropriate blocks of this proposed action would reduce the very high potential impacts that could be realized by the biota of coral and live bottom areas from activities resulting from the proposed action to very low impacts without affecting the amount of oil and gas resources that could be recovered in the area.

(2) Topographic Features Stipulation

The topographic features of the Central Gulf provide habitat for coral and coral community organisms (Section III.B.2.). As discussed in Section IV.D.1.a.(2), these communities would be severely adversely impacted by unrestricted oil and gas activities resulting from this proposal if such activities took place on or near these communities. DOI has recognized this problem for some years, and since 1974 stipulations have been made a part of leases on blocks on or near enough to these biotic communities for the nearby oil and gas activities to have an impact on these communities. It should be noted that this stipulation would in no way prevent the recovery of oil and gas resources, but it would serve to protect valuable and sensitive biological resources. The areas affected by this stipulation option are shown in Figure II-1.

This stipulation has been developed during the past 11 years in consultation and coordination with FWS and USGS. In addition, advice has been received from other agencies, such as USEPA and NMFS, as well as from industry and other interested groups. Finally, in designing this stipulation, extensive use has been made of BLM (now MMS) and industry studies in the area, including those monitoring studies required by lease stipulations; i.e., Bright and Rezak (1976, 1978a, 1978b, and 1981), and Texas A&M Research Foundation (1982 and 1983). Industry-funded monitoring reports may be examined in the Gulf of Mexico OCS Regional Office.

The Bright and Rezak and Texas A&M reports document that the biological communities of the Gulf shelf break banks are generally similar at similar depths. Thus, if the biota of a well-studied bank, such as the East Flower Garden Bank, in the 70-80 m depth zone is known, the biota of any other bank in generally the same hydrographic regime, such as Bright Bank, in the 70-80 m depth zone, can be predicted. These reports also document that, in general, the biota of the banks above 85 m tend to be unique, relief-dependent, and more typical of the Caribbean reef biota, while the biota found below 85 m tend to be the soft bottom organisms found throughout the Gulf. Hence, the 85 m isobath was chosen as the isobath to define the bank and to define the "No Activity Zone" within which no activities at all would be allowed in order to fully protect the unique and productive biota. In the few instances where the bank rises out of water depths of less than 85 m, the deepest closing isobath was chosen.

The proposed stipulation sets up two zones outside the "No Activity Zone" (the 85 m isobath) within which drilling and other activities are allowed, but within which the handling of drilling muds and cuttings and other discharges are restricted or monitored. In the "1 Mile Zone" all discharges must be shunted through a pipe to within 10 m of the bottom; this is to place these potentially harmful substances below the level of the nearby bank biota in the bottom water layer where there is no chance of these materials reaching the biota (Bright and Rezak, 1976, 1978a, 1978b, and 1981). In the "3 Mile Zone" the lessee may choose to either shunt as in the "1 Mile Zone" (a procedure known to work) or monitor the impacts of surface discharge on the biota of the bank. This option is available to the lessee since the evidence (NAS, 1983); Section IV.D.1.a.(2)) indicates that surface discharge is likely to have only a negligible risk to biota at distances greater than 1 nmi; monitoring of such surface discharges is required in order to confirm this contention and to provide an added measure of protection. The monitoring plan would be approved by the ORD.

Because Sweet Bank in the Central Gulf is so small and is surrounded by such very deep water (the depth drops very quickly to greater than 200 m around the bank), it does not require the protection of the two buffer zones, and so only a "No Activity Zone" is established there.

It should be noted that there are two banks in the WPA which affect blocks in the Central Gulf.

The banks which will cause this stipulation to be applied to blocks of the Central Gulf are:

Bank Name	Isobath (meters)	Bank Name	Isobath (meters)
18 Fathom Lump	85	Parker Bank	85
Bouma Bank	85	Fishnet Bank	76
Rezak Bank	85	Jakkula Bank	85
Sidner Bank	85	Sweet Bank[1]	85
Sonnier Bank	55	28 Fathom Bank	85
Sackett Bank	85	29 Fathom Bank	64
Ewing Bank	85	Bright Bank	85
Diaphus Bank	85	Geyer Bank[2]	85
Alderdice Bank	80	MacNeil Bank[2]	82

[1] Only paragraph (a) of the stipulation applies.
[2] Western Gulf of Mexico bank with a portion of its "3 Mile Zone" in Central Gulf of Mexico

The blocks affected by this stipulation are listed in Appendix A.

The stipulation reads as follows:

Topographic Features Stipulation
(Central Planning Area)

(a) No structures, drilling rigs, or pipelines will be allowed within the listed isobath ("No Activity Zone") of the banks as listed above.

(b) Operations within the area shown as "1 Mile Zone" shall be restricted by shunting all drill cuttings and drilling fluids to the bottom through a downpipe that terminates an appropriate distance, but no more than ten meters, from the bottom.

(c) Operations within the area shown as "3 Mile Zone" shall be restricted as specified in either (1) or (2) below at the option of the lessee.

(1) All drill cuttings and drilling fluids must be disposed of by shunting the material to the bottom through a downpipe that terminates an appropriate distance, but no more than ten meters, from the bottom.

(2) The operator (lessee) shall submit a monitoring plan. The monitoring plan will be designed to assess the effects of oil and gas exploration and development operations on the biotic communities of the nearby banks.

The monitoring program shall indicate that the monitoring investigations will be conducted by qualified, independent scientific personnel and that these personnel and all required equipment will be available at the time of operations. The monitoring team will submit its findings to the Regional Director (ORD) on a schedule established by the ORD, or immediately in case of imminent danger to the biota of the bank resulting directly from drilling or other operations. If it is decided that surface disposal of drilling fluids

> or cuttings present no danger to the bank, no further monitoring of that particular well or platform will be required. If, however, the monitoring program indicates that the biota of the bank are being harmed, or if there is a great likelihood that operations of that particular well or platform may cause harm to the biota of the bank, the ORD shall require shunting as specified in (1) above or other appropriate operational restrictions.

Some 198 blocks of the Central Gulf will be affected by the stipulation, 114 of which are already leased. Most of these 114 leases have a biological stipulation as a part of the lease. Therefore, this stipulation could affect 84 blocks, if all are leased as a result of this proposal. These blocks represent 3.1% of the blocks offered in the Central Gulf. Except for the "No Activity Zones," however, this stipulation would not restrict drilling locations and even the oil and gas resources below the "No Activity Zones" could be reached using directional drilling techniques.

Four of these banks in the Central Gulf (Sackett, Diaphus, Fishnet, and 29 Fathom) have been categorized by Bright and Rezak (1981) as somewhat less diverse and productive than the others although still deserving protection. There is some question as to whether these banks require the protection of the "3 Mile Zone." This question will continue to be discussed and evaluated, especially in light of the study by the National Academy of Sciences (1983) funded by DOI which reviewed the literature on the fates and effects of drilling muds and cuttings in the marine environment.

A list of all blocks affected by the Topographic Features Stipulation may be found in Appendix A.

Effect of the Lease Stipulation

This stipulation would prohibit any oil and gas activities in the "No Activity Zones" of the shelf break topographic features (Visual No. 11) and would require various restrictions, such as shunting and/or monitoring, in the "1 Mile Zone" and "3 Mile Zone" around these banks. This creation of a "No Activity Zone" will prevent the occurrence of any of the mechanical damage discussed above. This will eliminate the single most serious threat to coral reef and coral community areas: anchor damage (from oil and gas activities, at least; anchoring by other vessels, such as fishing boats, cannot be regulated by MMS)(Bright and Rezak, 1978b and 1981). Other mechanical damage due to oil and gas operations, such as rig, platform, and pipeline emplacement and smothering by drilling cuttings, will also be eliminated. Mechanical damage is probably the single most severe impact to benthic areas resulting from oil and gas operations. A "No Activity Zone" completely eliminates this threat to the area within the zone. The protection afforded by shunting all drilling effluents to very close to the bottom near high relief banks containing valuable biotic resources has been well documented (Bright and Rezak, 1981). The potentially harmful materials (in drilling muds) are trapped in the bottom boundary layer and do not get upon the bank where the biota of concern are located. Shunting has been successfully utilized in the Central and Western Gulf since 1973 and is currently part of many active leases in these areas. Shunting would be required in the "1 Mile Zone." Either shunting or monitoring would be required in the "3 Mile Zone." For a more complete discussion of these stipulations, see Volume 1, Section IV.D.2.a.(2) of the Final Regional EIS.

Experience since 1974 shows that the stipulation does work to prevent damage to the biota of the banks from the oil and gas activities resulting from the proposed action. This stipulation is a part of the lease on most of the 114 blocks in the Central Gulf which are currently leased near these features, and the provisions of the stipulation have been invoked in some leases near these banks even in the absence of the stipulation. The provisions of the stipulation have been considered necessary by the Secretary in the past, and they are certainly sufficient to protect the biota of these banks. Furthermore, any oil and gas resources present under such areas could be recovered using directional drilling techniques. The stipulation would not, however, protect the banks from the adverse effects of an accident such as a large blowout on a nearby oil or gas operation. Fortunately, blowouts are rare in the Gulf.

(3) Cultural Resources Stipulation

(a) "Cultural resource" means any site, structure, or object of historic or prehistoric archaeological significance. "Operations" means any drilling, mining, or construction or placement of any structure for exploration, development, or production of the lease.

(b) If the Regional Director (ORD) believes a cultural resource may exist in the lease area, the ORD will notify the lessee in writing. The lessee shall then comply with subparagraphs (1) through (3).

(1) Prior to commencing any operations, the lessee shall prepare a report, as specified by the ORD, to determine the potential existence of any cultural resource that may be affected by operations. The report, prepared by an archaeologist and geophysicist, shall be based on an assessment of data from remote-sensing surveys and of other pertinent cultural and environmental information. The lessee shall submit this report to the ORD for review.

(2) If the evidence suggests that a cultural resource may be present, the lessee shall either:

(i) Locate the site of any operation so as not to adversely affect the area where the cultural resource may be; or

(ii) Establish to the satisfaction of the ORD that a cultural resource does not exist or will not be adversely affected by operations. This shall be done by further archaeological investigation, conducted by an archaeologist and a geophysicist, using survey equipment and techniques deemed necessary by the ORD. A report on the investigation shall be submitted to the ORD for review.

(3) If the ORD determines that a cultural resource is likely to be present on the lease and may be adversely affected by operations, he will notify the lessee immediately. The lessee shall take no action that may adversely affect the cultural resource until the ORD has told the lessee how to protect it.

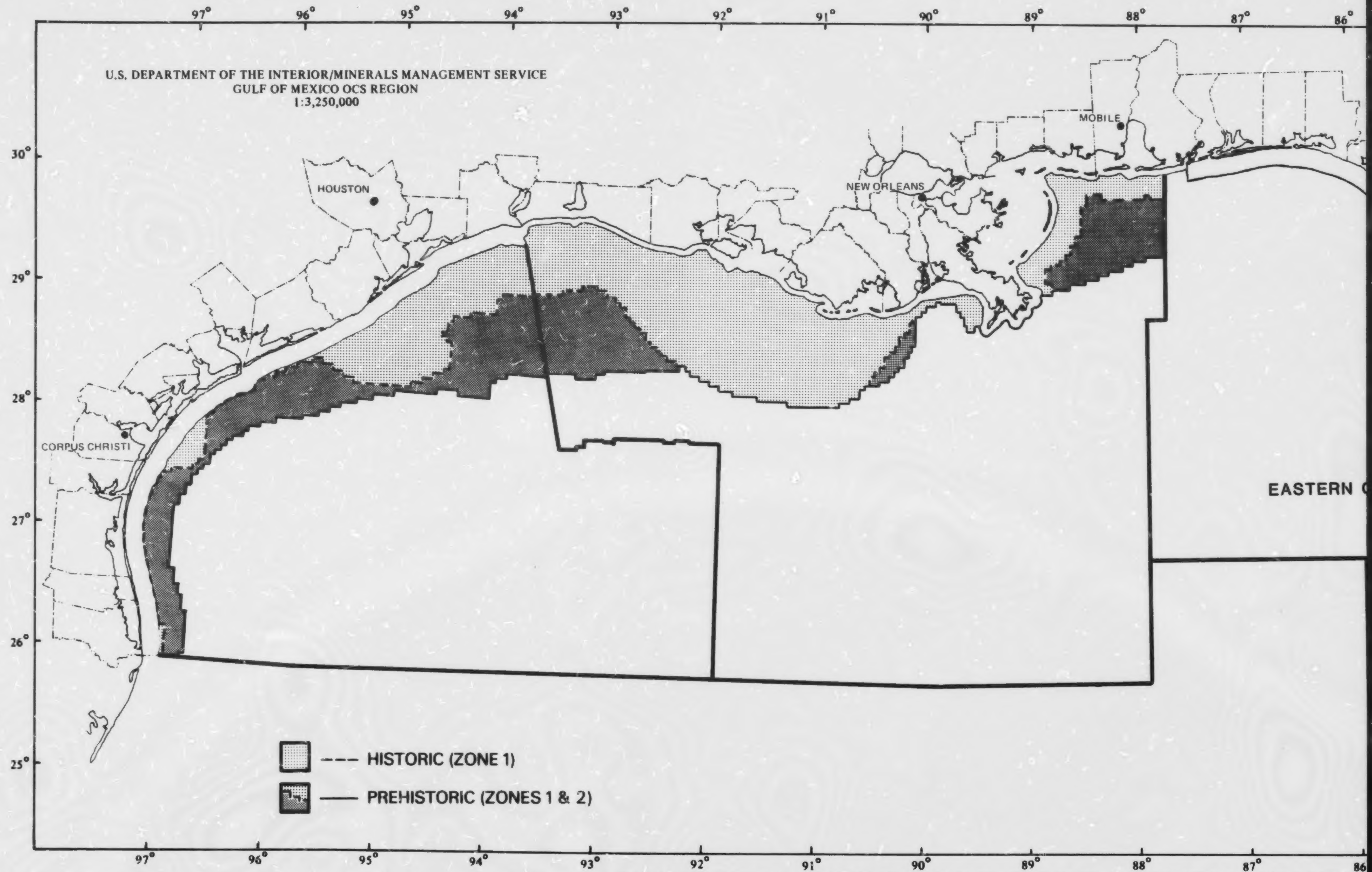
(c) If the lessee discovers any cultural resource while conducting operations on the lease area, the lessee shall report the discovery immediately to the ORD. The lessee shall make every reasonable effort to preserve the cultural resource until the ORD has told the lessee how to protect it.

There are two archaeological management zones in the Gulf of Mexico (Figure II-2). Zone 1 has a high potential both for the occurrence of historic shipwrecks and for prehistoric sites. Zone 2 has a high potential only for prehistoric sites. All blocks leased in Sales 104 and 105, which fall within Archaeological Zones 1 or 2, will require a remote sensing survey as specified in NTL 75-3 (Revision No. 1). Additionally, all blocks containing known shipwrecks (Volume 1, Section III.C.9., Tables III-38, III-39, and III-40 of the Final Regional EIS) which fall outside Zones 1 and 2 would require surveys at 150 m linespacing, if leased.

Effect of the Lease Stipulation

Historic

The two principle instruments for shipwreck detection are the magnetometer and the side scan sonar. For locating small historic shipwrecks (e.g., of wooden construction), 150 m linespacing provides only about a 25%-30% sample of the seafloor with the magnetometer (Clausen and Arnold,


U.S. DEPARTMENT OF THE INTERIOR/MINERALS MANAGEMENT SERVICE
GULF OF MEXICO OCS REGION
1:3,250,000
97°
96°
95°
94°
93°
92°
91°
90°
89°
88°
87°
86°
30°
29°
28°
27°
26°
25°
HOUSTON
CORPUS CHRISTI
NEW ORLEANS
MOBILE
EASTERN
--- HISTORIC (ZONE 1)
— PREHISTORIC (ZONES 1 & 2)

CULTURAL RESOURCE PROBABILITY ZONES

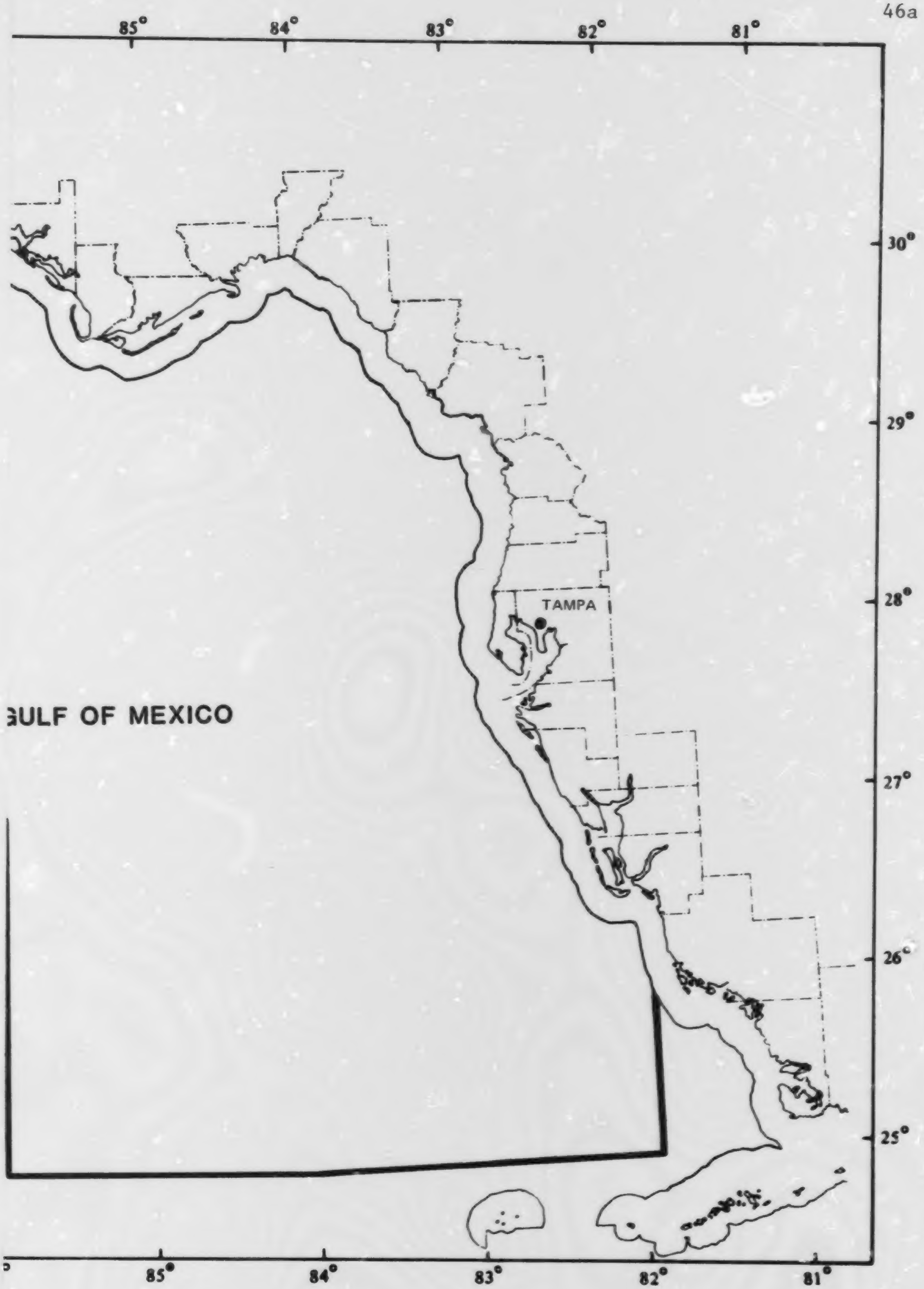

85°
84°
83°
82°
81°
30°
29°
28°
27°
26°
25°
TAMPA
GULF OF MEXICO
85°
84°
83°
82°
81°

Figure II-2.

46 B

1975). However, at this linespacing, side scan sonar can provide well over 100% coverage of the seafloor with good resolution.

Conducting surveys at 150 m linespacing for the protection of historic shipwrecks is based on the premise that avoidance of all unidentified magnetic anomalies and side scan contacts recorded within a survey area will result in the avoidance, and therefore, the protection of historically significant shipwrecks. This assumes either that all parts of a shipwreck are ferromagnetic and would be recorded by the magnetometer, or that all non-ferromagnetic parts of a wreck would be evident on the side scan records. Neither is necessarily the case.

In areas with a relatively hard bottom or in areas with only a thin veneer of unconsolidated sediments, it is probable that there would be some evidence on the side scan sonar records of any shipwreck within the survey area. However, over large portions of the Gulf of Mexico, the thickness of unconsolidated sediments is sufficient to completely conceal debris from most pre-20th century wrecks of wooden or composite construction (Clausen and Arnold, 1975). The primary instrument for shipwreck detection in this case would be the magnetometer.

According to the results of studies conducted by various marine archaeologists in their work with shipwrecks (Clausen and Arnold, 1975; Watts, 1980, Personal communication; and Saltus, 1982) at 150 m linespacing, it is possible to pass by an historically significant shipwreck with no indication whatsoever on the magnetometer record.

For a summary of the estimated effectiveness of the survey methods discussed above in ensuring the location or identification of significant historic resources within a survey area, see Volume 1, Section II.A.1.c.(2), Table II-2 of the Final Regional EIS.

Prehistoric

The subbottom profiler is the primary instrument utilized in evaluating the prehistoric site potential of a lease area. In order to construct plan-view maps of the near-surface stratigraphy and geomorphology within a survey area, it is necessary to interpolate between survey lines, regardless of the survey linespacing.

General information on the near surface geology within a lease area, such as the type of geomorphic features present, their probable environment and period of formation, general state of preservation, and depth of burial, could be determined equally well with data at either 150 or 300 m linespacing. This information is what helps in determining the potential for the occurrence, preservation, and recovery of prehistoric sites.

The accuracy in mapping the relict geomorphology in plan view from data collected at 300 m linespacing could be diminished by as much as 50% when compared to the accuracy obtainable at 150 m linespacing. This could subsequently diminish the accuracy in delineation of specific zones within a lease area which have a high probability for the occurrence of prehistoric sites. However, since geologic features are not entirely unpredictable in their general orientation and trend, this loss in mapping accuracy would probably not be significant in most cases.

For a summary of the estimated effectiveness of the survey methods discussed above in ensuring the location or identification of relict shelf geomorphology having a high probability for associated prehistoric sites, see Volume 1, Section II.A.1.c.(2), Table II-2 of the Final Regional EIS.

(4) Military Areas Stipulation

In the Central Gulf of Mexico approximately 708 lease blocks will be affected by the military stipulation applied within designated warning areas. The map showing the warning areas is Figure I-5. This stipulation has been applied to blocks in military warning areas in past lease sales in the Central Gulf. When exploratory drilling and related service vessel traffic and helicopter flights have occurred in a warning area, the military has been informed of all drilling activity, vessel trips, and air flights. The military has had no problems to date with joint usage and has always recommended utilizing the stipulation on all leasing operations within their warning areas.

As a result of applying the military stipulation to all oil and gas leases in the past, no joint usage conflicts have occurred and the impact from oil and gas development has been very low.

The stipulation reads as follows:

Military Areas Stipulation
(Central Planning Area)

Hold Harmless

Whether compensation for such damage or injury might be due under a theory of strict or absolute liability or otherwise, the lessee assumes all risks of damage or injury to persons or property, which occur in, on, or above the outer continental shelf, to any persons or to any property of any person or persons who are agents, employees, or invitees of the lessee, its agents, independent contractors, or subcontractors doing business with the lessee in connection with any activities being performed by the lessee in, on, or above the outer continental shelf, if such injury or damage to such person or property occurs by reason of the activities of any agency of the United States government, its contractors or subcontractors, or any of their officers, agents or employees, being conducted as a part of, or in connection with the programs and activities of the command headquarters listed in Table II-2.

Notwithstanding any limitation of the lessee's liability in Section 14 of the lease, the lessee assumes this risk whether such injury or damage is caused in whole or in part by any act or omission, regardless of negligence or fault, of the United States, its contractors or subcontractors, or any of its officers, agents, or employees. The lessee further agrees to indemnify and save harmless the United States against all claims for loss, damage, or injury sustained by the lessee, or to indemnify and save harmless the United States against all claims for loss, damage, or injury sustained by the agents, employees, or invitees of the lessee, its agents, or any independent contractors or subcontractors doing business with the lessee in connection with the programs and activities of the aforementioned military installation, whether the same be caused in whole or in part by the negligence or fault of the United States, its contractors, or subcontractors, or any of its officers, agents, or employees and whether such claims might be sustained under a theory of strict or absolute liability or otherwise.

Electromagnetic Emissions

The lessee agrees to control his own electromagnetic emissions and those of his agents, employees, invitees, independent contractors or subcontractors emanating from individual designated defense warning areas in accordance with requirements specified by the commander of the command headquarters listed in Table II-2 to the degree necessary to prevent damage to, or unacceptable interference with, DOD flight, testing or operational activities, conducted within individual designated warning areas. Necessary monitoring control, and coordination with the lessee, his agents, employees, invitees, independent contractors or subcontractors, will be effected by the commander of the appropriate onshore military installation conducting operations in the particular warning area; provided, however, that control of such electromagnetic emissions shall in no instance prohibit all manner of electromagnetic communication during any period of time between a lessee, its agents, employees, invitees, independent contractors or subcontractors and onshore facilities.

Operational

The lessee, when operating or causing to be operated on its behalf, boat or aircraft traffic into the individual designated warning areas shall enter into an agreement with the commander of the individual command headquarters listed in Table II-2, utilizing an individual designated warning area prior to commencing such traffic. Such an agreement will provide for positive control of boats and aircraft operating into the warning areas at all times.

Table II-2

Warning Areas' Command Headquarters

Central Planning Area

Warning Areas	Command Headquarters
W-155	Naval Air Training Command Training Wing Six Naval Air Station Pensacola, Florida
W-453	Air National Guard Training Site Gulfport, Mississippi
W-92	Naval Air Station New Orleans, Louisiana
Eglin Water Test Areas 1 and 3	Commander Armament Division Eglin AFB, Florida

Western Planning Area

Warning Areas	Command Headquarters
W-228	Naval Air Training Comand Naval Air Station Corpus Christi, Texas
W-602	Director of Training Deputy Chief of Staff, Operations Headquarters Strategic Air Command Offutt AFB, Nebraska

Effect of the Lease Stipulation

The effect of the stipulation on the impacts of the proposal will be to reduce potential conflicts between military missions and service boat traffic and helicopter flights. The stipulation, where applied, requires the lessee/operator to notify the respective commander of each warning area of all activities scheduled within the area, including the placement of rigs and platforms, a notification prior to each service vessel and helicopter flight into the area, and an agreement by the lessee/operator to curtail all electromagnetic emissions while traveling through or into a warning area. The stipulation will have no effect on the location of exploration rigs and platforms or the numbers of vessels and helicopters, but it will mitigate the impact of an increasing amount of oil and gas-related traffic.

2. Alternative B - Delay Action

a. Description of the Alternative

While there are no known specific issues that might cause a delay at this time, it is possible that a delay could occur for reasons that may arise before the sale is finalized. Delaying the sale would withhold unleased blocks in the CPA up to a 1-year period or until an even later time on the existing 5-year schedule.

b. Summary of Impacts

All impacts associated with the proposed action, as discussed in Section II.A.1., would be delayed until such time as the sale is reinstated.

3. Alternative C - No Action

a. Description of the Alternative

The alternative is equivalent to cancellation of a sale scheduled for a specific timeframe on the approved 5-year OCS Oil & Gas Leasing Schedule. Sales in the Central Gulf are scheduled on an annual basis. Therefore, the opportunity is postponed or foregone for development of the estimated 0.15 billion bbls of oil and 1.23 tcf of gas that could have resulted from this sale in the Central Gulf. This no action alternative would be contrary to our national goal of expediting development of our domestic resources as a means of lessening our dependence on foreign oil.

b. Summary of Impacts

All impacts, positive and negative, associated with the proposed action (as discussed in Section IV.D.1.a.) would be cancelled and the importation of foreign oil at present or increased levels would be continued. There would be an increased environmental risk of oil spills caused by tankering the oil. Adverse socioeconomic impacts could include loss of employment opportunities, payroll revenues, and tax revenues. The economic stability of the coastal region could be negatively affected. Also, see Section IV.D.1.d. for a discussion of the development of alternative energy supplies as replacement sources for lost domestic production. Table IV-50 presents replacement energy equivalents for the estimated resources for this sale.

4. Comparison of Alternatives

Table S-3 provides a comparison and summary of the impact levels of the Proposed Action (Alternative A), delaying the action (Alternative B), no action (Alternative C), and the cumulative analysis for Sale 104. The definitions of the levels of impact for each alternative are located in Table S-4.

Alternative A (the proposed action), which includes committed biological, cultural resources, and military areas stipulations, has the potential to result in very low, low, or moderate impacts on all the resource categories of concern with the exception of the following: the level of impact on sensitive coastal habitats (wetlands) in coastal subarea C-3 is expected to be high; the level of impact on cultural resources could be very high in all areas, but the risk of the impacts actually occurring is low in all areas except for the impact on historic resources in the eastern portion of the CPA where it is expected to be high; and the level of impact on military warning area W-155 is expected to be high.

Alternative B, delaying the proposed action, would postpone any potential adverse impacts for a period of up to one year, or until a later point in time. The level of impacts would have to be evaluated at that time; however, the overall level of impacts on the resource categories are unlikely to change from those listed for the proposed action.

Alternative C, no action, would preclude any impacts to the resource categories listed in Table S-3 from the proposed action or other alternatives.

B. WESTERN GULF SALE 105

1. Alternative A - The Proposed Action

a. Description of the Proposed Action

The proposed action is the offering for lease of all unleased blocks within the WPA (Figure I-1), with the exception of those areas being deferred by the Department, namely Blocks A-398 and A-375 in the High Island Area, East Addition, South Extension (West and East Flower Garden Banks, respectively), and 123 blocks adjacent to the provisional United States maritime boundary with the Republic of Mexico. Biological, cultural resources, and military area stipulations are included as part of the proposed action as mitigating measures. The proposed action is consistent with the areawide approach to sales based on geologically favorable areas, the rationale for which is described in detail in the Final Supplement to the Final Environmental Statement for the Proposed Five-Year OCS Oil and Gas Lease Sale Schedule (USDI, BLM, 1982).

The proposed action is scheduled for July 1986. The unleased area available for leasing was 28.2 million acres on 5,089 blocks as of February 1985. However, this amount will be modified somewhat as a net result of proposed Sale 102 (August 1985) leasing and the relinquishment of existing leases in the coming months. Unleased blocks are located from approximately 9-222 miles offshore in water depths ranging from approximately 8 m to over 3,000 m. The estimated amount of hydrocarbon resources to be discovered and produced (recovered) as a result of the proposed action are 0.10 billion barrels of oil and 1.34 tcf of gas.

The analysis of impacts summarized below and described in detail in Section IV.D.2.a. is based on a development scenario (Most Likely Find or M Scenario) formulated to provide a set of assumptions and estimates on the amounts, locations, and timing for OCS exploration, development, and production operations and facilities, both offshore and onshore. A detailed discussion of the M Scenario and major related impact producing factors is included in Sections IV.A. and IV.B. Table II-3 summarizes major elements of the M Scenario and related impact producing factors for the proposed action. Besides the hydrocarbons resource recovery estimates cited above, the following major assumptions and estimates were considered in the impact analyses for the proposed action.

- The drilling of 320 exploration and delineation wells during the period 1987-1997.
- The installation of 20 production platforms and the drilling of 170 production wells during the period 1988-1999.
- Oil and gas production beginning in 1988 and reaching peak annual production in 1995 for oil (12 million bbls) and in 1996 for gas (161 billion cubic feet).
- Estimated drilling mud solid discharges of 1.45 million bbls and estimated drill cutting discharges of 0.16 million cubic yards.
- Hydrocarbon production transported by pipeline to onshore processing facilities in Texas and Louisiana.

Table II-3

Summary - Major Elements of the M Scenario and Related Impact Producing Factors for the Proposed Action Western Gulf Sale 105

Resources Expected to be Developed[1]	
Oil (billion bbls)	0.10
Gas (tcf)	1.34
Offshore Infrastructure	
Exploration and Delineation Wells Drilled	320
Production Platforms Installed	20
Production Wells Drilled	170
Pipeline (miles constructed)[2]	160
Offshore Discharges[3]	
Drilling Mud Material (million bbls)	1.45
Drill Cuttings (million cubic yards)	0.16
Formation Waters (billion bbls)	0.001-0.090
Offshore Air Emissions (peak year - 1,000 tons)	
NO_x	3.93
CO	0.72
SO_x	0.07
VOC	0.93
TSP	0.01
New Onshore Facilities[4]	
Service Bases	0-1
Pipeline Landfalls	0-1
Pipeline (miles constructed)	0-20
New Resident Population (1,000)[5]	0.9
Transportation Vessel Traffic[6]	8,550
Transportation Helicopter Traffic[6]	16,060
Oil Spill Contacts[7]	
Large Spills (≥ 1,000 bbls)	1
Medium Spills (50-999 bbls)	1
Small Spills (1-49 bbls)	13

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[1] Estimates of oil and gas expected to be discovered and produced as a result of the proposed action.

[2] Gathering and transmission pipelines.

[3] Total amount related to the exploration and development activity.

[4] Maximum number in expected range. See Table IV-7 for location by coastal subarea. See Table IV-49 for estimated acreage used for each type of new facility.

[5] Maximum (peak year) level.

[6] Number of trips (outbound plus inbound) for peak year activity.

[7] Assumed number of oil spills occurring and contacting coastal land segments within 10 days for large and medium spills and within 3 days for small spills. Spills assumed to occur during the the 18-year production period (1988-2005). The average size of a large spill is estimated at about 17 thousand bbls based on historic statistics.

- The construction of 160 miles of offshore pipeline and possibly one new transmission pipeline landfall located in coastal subarea W-2 with up to 20 miles of onshore routing.

- Onshore support activities being provided entirely from existing facilities in Texas and Louisiana, with the possible exception of a new service base for development/production operations. Likely potential locations for a new service base (which could use up to 75 acres) include Cameron, Willacy, Nueces, and San Patricio Counties in Texas.

- A total of one large oil spill within 10 days (1,000 bbls or greater) is assumed to occur and contact land as a result of the proposed action. The impact of this spill is considered for each land segment having a 1% or greater chance of being contacted (within 10 days) by a spill occurring as a result of the proposed action (Nueces, Matagorda, Brazoria, Galveston, and Chambers County). It is noted that the oil spill risk analysis estimates that there is an 18% chance of one or more spill occurrence and contact with land as a result of the proposed action. Section IV.A.5. discusses the oil spill contact assumptions in more detail.

b. Summary of Impacts

The following are summaries of the detailed impact analysis of the proposed action which are included in Section IV.D.1.b. It is noted that these summaries are limited to the impact of the proposed action above (under the M Scenario); the cumulative impacts which are discussed in Section IV.D.2.a. are not summarized here. Table S-3 indicates the level of impact on each resource category estimated as a result of the proposed action and the cumulative factors.

Five levels of impact are defined for each impact topic and used in the conclusion to indicate the degree of intensity or diversity of the impact. The five levels are designated by the following qualitative degrees of impact: very high; high; moderate; low; and very low. Definitions of these impact levels for each research category are provided in Table S-4.

To facilitate the analysis the Federal offshore area is divided into subplanning areas (the WPA is comprised of three subplanning areas: W-1, W-2, and W-3). In addition, the coastal region is divided into coastal subareas (the Western Coastal Area is comprised of two coastal subareas: W-1 and W-2). These subareas are delineated on Figure IV-1.

(1) Impacts on Sensitive Coastal Habitats (Wetlands)

The construction of up to one new service base and one new pipeline with onshore routing in coastal subareas W-1 and W-2, respectively, could result in the destruction, alteration, or interference with up to 255 acres of sensitive coastal habitats (wetlands). In addition, one large (1,000 bbls or greater) and several smaller oil spill contacts with sensitive coastal wetlands (marshes and seagrass beds) are assumed. Such contacts are expected to cause low or moderate impacts depending on the specific resource affected. The expected levels of impact on sensitive coastal habitats are estimated to be very low in coastal subarea W-1 and low in coastal subarea W-2.

(2) Impacts on Sensitive Offshore Habitats

As described in Section IV.D.2.a.(2), the major potential impact producing factors that could affect biologically sensitive areas of topographic features in the Western Gulf are mechanical damage due to anchors, drilling, pipelines, platform emplacement, smothering, and blowouts, and toxicity of the drilling fluids. Oil and gas operations resulting from this proposal could cause very high and potentially long-lasting damage due to the relatively small coral and coral community areas of the Gulf (especially the East and West Flower Garden Banks) if unrestricted operations take place on or near these important sensitive habitats. High deleterious impacts to fish habitats of the topographic features may also affect the recreational and commercial fisheries of the area, and the intrinsic biological, ecological, and aesthetic values of these areas might be seriously diminished.

However, the stipulation described in Section II.B.1.c.(1) (which is included as part of this proposal) will mitigate all or nearly all of these adverse impacts (except for rare catastrophic accidents) without reducing the amount of oil and gas resources that could be recovered, resulting in a very low expected impact level to these sensitive offshore habitats.

This stipulation has been developed during the past 11 years to protect biological resources of the Western Gulf of Mexico.

(3) Impacts on Water Quality

(a) Offshore

As a result of Sale 105, localized offshore water quality degradation will occur in the WPA. Immediate impacts would be brought on by increased drilling of up to 320 exploration and delineation wells, construction, and pipelaying activities resulting from the laying of up to 160 miles of pipeline. Other impacts would stem from additional dredging activities and discharges of drilling muds, fluids, cuttings, sanitary and domestic wastes, and formation waters from the 20 platforms projected for this area. The expected impacts are estimated to be high around platforms and construction sites depending on existing local water conditions, with the extent of such impacts extending from only a few meters to tens of meters from these sites. These impacts will decrease to very low with distance (500-1,000 m) from the source. The overall impact to offshore water quality is estimated to be low.

(b) Onshore

Onshore water quality degradation will occur as a result of increased nonpoint and point sources of pollution, especially in those areas of Texas (Sabine Pass to Lavaca Bay) where water quality problems persist. Any increased point source impacts from existing onshore support can be mitigated by Federal and State regulations and guidelines. The construction of up to 20 miles of onshore pipeline in coastal subarea W-2 will create nonpoint source increases in surface runoff; however, these nonpoint sources may be minimized by controlling erosional effects generated within construction site boundaries. Impacts to onshore water quality are expected to be low.

(4) Impacts on Air Quality

Sale 105 is expected to impact air quality from activities such as catastrophic events (blowouts and oil spills), offshore operational emissions from drilling, platform installation, and production. Additional gas processing or refining capability is not expected to be needed as a result of the proposed action. Impacts are assumed to be felt in areas classified as nonattainment or PSD Class I areas that are adjacent to more OCS-related activities, i.e., Cameron, Nueces, Galveston, Jefferson, Brazoria, and Harris Counties in Texas. Coastal air quality could deteriorate if an unflared blowout caused the uncontrolled release of sour gas (high H_2S content) into the atmosphere near shore. The expected levels of OCS related activities (20 platforms and no new gas processing or refining facilities) should cause little long-term degradation of ambient air quality with no significant effects on nonattainment or PSD areas. (For a detailed analysis, see Section IV.D.2.a.(4).) Short-term degradation of air quality could occur as a result of the uncontrolled release of sour gas from a blowout. Overall impacts on air quality are expected to be moderate in any control area nearby an uncontrolled sour gas blowout. Low impacts are expected in Cameron, Nueces, Galveston, Jefferson, and Brazoria Counties. Very low impacts are expected throughout the remainder of the coastal area in the Western Gulf.

(5) Impacts on Endangered and Threatened Species

The impact producing factors which could affect endangered and threatened species as a result of the proposed action in the WPA include OCS-related oil spills, collision with offshore support vessels, and disturbance from onshore construction. One large (1,000 bbls or greater) and several smaller oil spill contacts with endangered and threatened species habitats are assumed.

(a) Sea Turtles

Oil spill contacts are expected to have a very low impact on sea turtles depending on the specific habitat affected. Offshore support vessel traffic into the Texas ports is estimated to increase less than 2% and is not likely to impact sea turtles. A new pipeline requiring a total of about 280 acres in Matagorda, Brazoria, Galveston, Chambers, or Jefferson Counties in Texas is unlikely to affect sea turtles and their habitats in these areas. The overall expected level of impact on sea turtles is estimated to be low.

(b) Brown Pelicans

Oil spill contacts are expected to have a very low impact on brown pelicans depending on the specific habitat affected. A new pipeline requiring a total of about 280 acres in Matagorda, Brazoria, Galveston, Chambers, or Jefferson Counties in Texas is unlikely to affect brown pelicans and their habitats in these areas. The overall expected level of impact on brown pelicans is estimated to be low.

(6) Impacts on Marine Mammals

The impact producing factors which could affect marine mammals as a result of this proposal in the WPA include OCS related oil spills, collision with offshore support vessels, and disturbance from offshore activities. One large (1,000 bbls or greater) and several smaller oil spill contacts with marine mammal habitats are assumed. Such spill contact is expected to cause a very low level of impact. Offshore support vessel traffic is estimated to increase less than 2% in this coastal area and is not likely to impact marine mammals. The disturbance and noise associated with seismic exploration and drilling of about 490 wells will be short-term and localized near drilling sites. The overall expected level of impact on marine mammals is estimated to be very low.

(7) Impacts on Coastal and Marine Birds

The impact producing factors which could affect coastal and marine birds as a result of this proposed action in the WPA include OCS-related oil spills and disturbance from onshore construction. One large (1,000 bbls or greater) and several smaller oil spill contacts with nesting and/or feeding areas is assumed. Such spill contacts are expected to cause a low level of impact. A new pipeline requiring a total of about 280 acres in Matagorda, Brazoria, Galveston, Chambers, or Jefferson Counties in Texas is unlikely to affect coastal and marine birds and their habitats in these areas as construction sites must be approved by Federal, State, and local agencies and will be located to have the least environmental impacts. The overall expected level of impact on coastal and marine birds is estimated to be very low.

(8) Impacts on the Commercial Fishing Industry

Several impact producing factors from this alternative could affect the commercial fishing industry, including loss of fishing area through construction of platforms/structures, gear conflicts, and an offshore oil spill greater than 1,000 bbls. As a result of these impact producing factors, a moderate impact (a 1% or less economic loss to the commercial fishing industry, some financial loss to the fishermen, and secondary employment affected) could occur to the commercial fishing industry.

(9) Impacts on Offshore Marine Recreational Fishing

The 400 oil and gas structures in the Western Gulf off Texas have had a moderate impact on the offshore recreational fishing effort, participation, and catch in the last 10-15 years. The 20 platforms expected to result from 1986 lease sales in the Western Gulf will perpetuate, expand, and replace high profile de facto artificial fishing reefs on the Texas OCS. These 20 platforms will greatly improve sports fishing prospects in their vicinity. Platforms are more likely to effect subregional fishing trends if they are located within fairly close proximity to the Brownsville, Corpus Christi, or Houston/Galveston fishing centers. Oil spills will temporarily (a day or two) remove the affected area (slick area) from sports fishing activity but is unlikely to cause detectable declines in the overall quantity or quality of marine recreational fishing. The proposed action is expected to have a very low positive impact on marine recreational fishing in the Western Gulf of Mexico.

(10) Impacts on Major Shorefront Recreational Beaches

One large (1,000 bbls or greater) and several smaller oil spill contacts with major shorefront recreational beaches are assumed. Such spill contacts could be with Padre Island National Seashore or Galveston Island, causing temporary closure of the impacted areas to beach recreational use. Residuals such as trash and debris associated with offshore operations will inadvertently wash up on major recreational beaches and detract from the aesthetics of beach use and add to the maintenance problem of recreational beach administrators causing localized, short-term inconveniences. The overall expected level of impact on major shorefront recreational beaches is estimated to be low.

(11) Impacts on Cultural Resources

(a) Historic

The impact producing factors which could affect offshore and onshore historic cultural resources include interactions with drilling rigs, platforms, pipelines, anchors, construction of onshore facilities, and contact by spilled oil. The impact levels to historic sites, should an interaction occur with an impact producing factor, range from low to very high depending on the type of interaction and the uniqueness of the data lost as a result of the interaction. However, the risk of any of these impacts occurring is low. Considering the range of impact levels and the risk, the expected impact to historic sites in the Western Gulf as a result of the proposed action is moderate.

(b) Prehistoric

The impact producing factors which could affect offshore and onshore prehistoric cultural resources are the same as those listed above for historic resources. The impact levels to prehistoric sites, should an interaction occur with an impact producing factor, range from moderate to very high depending on the type of interaction and the uniqueness of the data lost as a result of the interaction. However, the risk of any of these impacts occurring is low. Considering the range of impact levels and the risk, the expected impact to prehistoric sites in the Western Gulf as a result of the proposed action is moderate.

(12) Impacts on Tourist Activity/Industry

One large spill contact (1,000 bbls or greater) with a major recreational beach important to the tourist industry is assumed. This spill contact might occur with any one of the three land segments along the Texas coast, each of which has a different level of tourist activity. Thus, depending on the land segment contacted, the estimated potential monetary loss per affected county would range from $8.2 million to $40.0 million. This potential loss indicates a very low level of impact for the area.

(13) Impacts on Military Use/Warning Areas

As a result of Sale 105, the major potential impacts identified in Section IV.D.2.a.(14) are the number and locations of rigs and platforms, and the number of service vessels and helicopters crossing the military warning areas. The greatest number of exploration rigs in the peak year (1991) is projected to be 2-3 and they are expected to be distributed among warning areas W-228 and W-602. The increase over past activity is low and there has been very little conflict and limited impact of present activities on military use. The two platforms resulting from Sale 105 are expected to be scattered within the warning areas, and the impacts from these locations on ship maneuvers and aircraft missions are expected to be high in W-228 and low in W-602. In consideration of the location of the potential resources indicated in Visual No. 13, the trend is projected for exploration and development facilities to locate in the high resource potential areas, leaving the remaining areas of deeper water and moderate resource potential open. The number of service vessels and helicopter flights resulting from oil and gas activity from Sale 105 is expected to have a low impact on ship maneuvers and aircraft missions. The increases in traffic are expected to be slightly less than the increases resulting from previous sales, and the oil- and gas-related traffic assumes only a 20%-40% increase of the total increase of the traffic to be passing through each warning area. The proposed action is expected to have a low level of impact on warning area W-602 and a high level of impact on warning area W-228.

The stipulation that is part of the proposed action will mitigate the impacts of oil and gas related traffic, but it will not reduce the potential impacts of other conflicts, such as the locations and numbers of exploratory rigs and production platforms (for stipulation, see Section II.B.1.c.(3).

(14) Impacts on Water Supply

As a result of Sale 105, increased demands on coastal water resources may be expected to occur from increased OCS activities in the WPA. Existing water supplies would be impacted due to localized population increases and increased demands of freshwater for industrial processes initiated by onshore support facilities, primarily the one new service base projected for coastal subarea W-1. The Texas coastal area presently depends heavily on its water resources for industrial, municipal, and agricultural uses. Highly localized impacts to the water supplies of the Sabine Pass and the Houston-Galveston areas could persist with escalated OCS support activities. This alternative is expected to cause a low impact on regional water supply.

(15) Impacts on Local Employment, Income, and Population

The impact on local employment, income, and population due to proposed Sale 105 is expected to occur throughout the Texas coastal region and part of the Louisiana coastal region. Most of the employment generated by the proposed sale would allow a continuation of employment generated by 1983, 1984, and 1985 areawide Gulf OCS lease sales. However, a small percentage of this employment is expected to attract new residents into the region. This new resident employment of about 470 jobs with a payroll of about $11.5 million (averaging $24,500 per employee) will require a population influx of 1,081. These growths in employment, payroll, and population will occur in 1987 and will be less than 1% of the total employment, payroll, and population within affected coastal areas in that year. Therefore, the impact on employment, payroll, and population is expected to be very low in all affected coastal subareas from Sale 105.

(16) Impacts on Community Infrastructure

The proposed sale is estimated to generate a population growth of 900 persons distributed primarily in the 17 counties in coastal subareas W-1 and W-2. These new residents will impact community infrastructure through increased demand for, and use of, commonly provided public, semi-public, and private services and facilities. Section IV.D.2.a.(16) lists the typical impacts of population growth on community services and facilities. Such increases could cause reductions in the quality of services and other adverse effects. However, the largest estimated average annual population increases are 500 persons in Harris County, 100 persons in Nueces County, and less than 50 persons for the other affected counties. The average annual population growth rates are less than 0.05% for all the potentially affected counties. These amounts of population growth and related increases in the demand for, and use of, community services and facilities indicate a very low level of expected impact.

(17) Impacts on State and Local Land Use Management

Analysis of the activities/facilities estimated to result from the proposed action (M Scenario), the Texas coastal management program, and local land use policies indicates that potential incompatibilities or conflicts can be avoided or effectively mitigated. A number of mitigating measures are incorporated into the Federal regulatory mechanisms governing the proposed lease sale which provide effective control over effects addressed by the coastal management program. In addition, postsale proposals to use specific sites must go through necessary Federal, State, and local review and permitting procedures. On the basis of this analysis, it is considered likely that the estimated OCS-related activities/facilities can be designed, located, constructed, and operated in a manner such that the expected level of impact on State and local land use management policies would be very low.

(18) Impacts on Ports and Marine Transportation

As a result of the proposed action, vessel traffic is expected to increase by about 10% in W-1, 3% in W-2, and 3% in C-1 (ports and traffic in C-1 will be affected by activities occurring in W-3) in the peak year of activity (1991). The development of infrastructure associated with the proposed action is expected to result in the emplacement of 20 additional fixed structures: 5 in W-1, 12 in W-2; and 3 in W-3. The impacts on the demand for port and harbor facilities and on the likelihood of conflicts between vessels and vessels and vessels and structures resulting from the proposed action are expected to be moderate in subarea W-1 and low in W-2 and C-1.

c. Stipulations Included in the Proposed Action

(1) Topographic Features Stipulation

The topographic features of the Western Gulf provide habitat for coral and coral community organisms (Section III.B.2.). As discussed in Section IV.D.2.a.(2), these communities would be severely adversely impacted by unrestricted oil and gas activities resulting from this proposal if such activities took place on or near these communities. DOI has recognized this problem for some years, and since 1974 stipulations have been made a part of leases on blocks on or near enough to these biotic communities for the nearby oil and gas activities to have an impact on these communities. It should be noted that this stipulation will in no way prevent the recovery of oil and gas resources, but it will serve to protect valuable and sensitive biological resources. The areas affected by this stipulation option are shown in Figure II-1.

This stipulation has been developed during the past 11 years in consultation and coordination with FWS and USGS. In addition, advice has been received from other agencies, such as USEPA and NMFS, as well as from industry and other interested groups. Finally, in designing this stipulation, extensive use has been made of BLM (now MMS) and industry studies in the area, including those monitoring studies required by lease stipulations; i.e., Bright and Rezak (1976, 1978a, 1978b, and 1981), and Texas A&M Research Foundation (1982 and 1983). Industry-funded monitoring reports may be examined in the Gulf of Mexico OCS Regional Office.

The Bright and Rezak and Texas A&M reports document that the biological communities of the Gulf shelfbreak banks are generally similar at similar depths. Thus, if the biota of a well-studied bank, such as the East Flower Garden Bank, in the 70-80 m depth zone, is known, the biota of any other bank in generally the same hydrographic regime, such as Bright Bank, in the 70-80 m depth zone, can be predicted. These reports also document that, in general, the biota of the banks above 85 m tend to be unique, relief-dependent, and more typical of the Caribbean reef biota, while the biota found below 85 m tend to be the soft bottom organisms found throughout the Gulf. Hence, the 85 m isobath was chosen as the isobath to define the bank and to define the "No Activity Zone," within which no activities at all would be allowed in order to fully protect the unique and productive biota. In the few instances where the bank rises out of water depths of less than 85 m, the deepest closing isobath was chosen.

The stipulation sets up two zones outside the "No Activity Zone" (the 85 m isobath) within which drilling and other activities are allowed, but within which the handling of drilling muds and cuttings and other discharges are restricted or monitored. In the "1 Mile Zone" all discharges must be shunted through a pipe to within 10 m of the bottom; this is to place these potentially harmful substances below the level of the nearby bank biota in the bottom water layer where there is no chance of these materials reaching the biota (Bright and Rezak, 1976, 1978a, 1978b, and 1981). In the "3 Mile Zone" the lessee may choose to either shunt as in the "1 Mile Zone" (a procedure known to work), or monitor the impacts of surface discharge on the biota of the bank. This option is available to the lessee since the evidence (NAS, 1983; Section IV.D.1.a.(2)) indicates that surface discharge is likely to have only a negligible risk to biota at distances greater than 1 nmi; monitoring of such surface discharges is required in order to confirm this contention and to provide an added measure of protection. The monitoring plan would be approved by the ORD.

There are several exceptions to the discussion above, in which the stipulation applied at blocks around certain banks is somewhat different.

The first exception is at the East and West Flower Garden Banks. These important features, containing the northern-most examples in the Gulf of living coral reefs, are protected to a slightly greater degree than the other banks. This greater protection came about as a result of consultation with and the strong recommendations of USEPA and NOAA. Furthermore, the Flower Gardens are again being considered for National Marine Sanctuary status (Section I.B.6.a.) and have high visibility and interest among recreational SCUBA divers, fishermen, and environmental groups; hence, the additional protection was considered prudent. The added provisions of the stipulation at the Flower Gardens are that: (a) the "No Activity Zone" is based on the 100 m isobath instead of the 85 m isobath and is defined by the "¼¼¼" system (a method of defining a specific portion of a block) rather than the actual isobath; (b) both shunting and monitoring are required in the "1 Mile Zone" instead of only shunting; and (c) there is a "4 Mile Zone" instead of a "3 Mile Zone" in which shunting is required rather than a choice between shunting or monitoring.

The second exception is for seven banks (Mysterious, Blackfish, Big and Small Dunn Bars, 32 Fathom, Claypile, and Coffee Lump), which are of such low relief that shunting is considered counterproductive in that it would put the potentially toxic drilling muds in the same water zone as the bank biota that are being protected. Hence, there are no buffer zones around these banks and neither shunting nor monitoring is required.

The third exception is for another seven banks, all off the south Texas coast (Dream, Southern, Hospital, North Hospital, Aransas, South Baker, and Baker) having little relief and rising from water shallower than those mentioned above and which are subjected to a much higher level of natural turbidity and sedimentation and upon which the biotic communities are less diverse and productive. These banks will receive protection by a stipulation prohibiting any activity within the boundary of the bank itself, which will usually be the deepest closing isobath of the bank, and by requiring shunting within 1 nmi of the bank, and for production drilling only, requiring shunting within 3 nmi of the bank.

It should be noted that there are five banks in the CPA which affect blocks in the Western Gulf.

The banks which will cause this stipulation to be applied to blocks of the Western Gulf are:

Bank Name	Isobath (meters)	Bank Name	Isobath (meters)
Mysterious Bank[1]	74, 76, 78, 80, 84	Coffee Lump[1]	Various
	(see leasing map)		(see leasing map)
Blackfish Ridge[1]	70	West Flower Garden Bank[4]	100
Dream Bank[2]	78, 82		(defined by ¼¼¼ system)
Southern Bank[2]	80	East Flower Garden Bank[4]	100
Hospital Bank[2]	70		(defined by ¼¼¼ system)
North Hospital Bank[2]	68	MacNeil Bank	82
Aransas Bank[2]	70	29 Fathom Bank	64
South Baker Bank[2]	70	28 Fathom Bank	85
Baker Bank[2]	70	Geyer Bank	85
Big Dunn Bar[1]	65	Elvers Bank	85
Small Dunn Bar[1]	65	Bright Bank[3]	85
32 Fathom Bank[1]	52	18 Fathom Lump[3]	85
Stetson Bank	62	Rezak Bank[3]	85
Claypile Bank[1]	50	Sidner Bank[3]	85
Applebaum Bank	85	Parker Bank[3]	85

[1] Low Relief Banks - only paragraph (a) of the stipulation applies.

[2] Other South Texas Banks - paragraph (c) of the stipulation shall not apply; for production and development operations only, the provisions of paragraph (b) shall apply in both the "1 Mile Zone" and the "3 Mile Zone."

[3] Central Gulf of Mexico bank with a portion of its "1 Mile Zone" and/or "3 Mile Zone" in the Western Gulf of Mexico.

[4] Flower Garden Banks - has a "4 Mile Zone" vice "3 Mile Zone"; in the "1 Mile Zone," paragraph (c)(2) of the stipulation shall apply in addition to paragraph (b); in the "4 Mile Zone," only paragraph (b) shall apply.

The blocks affected by this stipulation are listed in Appendix A.

The stipulation reads as follows:

Topographic Features Stipulation
(Western Planning Area)

(a) No structures, drilling rigs, or pipelines will be allowed within the listed isobath ("No Activity Zone") of the banks as listed above.

(b) Operations within the area shown as "1 Mile Zone" shall be restricted by shunting all drill cuttings and drilling fluids to the bottom through a downpipe that terminates an appropriate distance, but no more than ten meters, from the bottom.

(c) Operations within the area shown as "3 Mile Zone" shall be restricted as specified in either (1) or (2) below at the option of the lessee.

(1) All drill cuttings and drilling fluids must be disposed of by shunting the material to the bottom through a downpipe that terminates an appropriate distance, but no more than ten meters, from the bottom.

(2) The operator (lessee) shall submit a monitoring plan. The monitoring plan will be designed to assess the effects of oil and gas exploration and development operations on the biotic communities of the nearby banks.

The monitoring program shall indicate that the monitoring investigations will be conducted by qualified, independent scientific personnel and that these personnel and all required equipment will be available at the time of operations. The monitoring team will submit its findings to the Regional Director (ORD) on a schedule established by the ORD, or immediately in case of imminent danger to the biota of the bank resulting directly from drilling or other operations. If it is decided that surface disposal of drilling fluids or cuttings present no danger to the bank, no further monitoring of that particular well or platform will be required. If, however, the monitoring program indicates that the biota of the bank are being harmed, or if there is a great likelihood that operation of that particular well or platform may cause harm to the biota of the bank, the ORD shall require shunting as specified in (1) above or other appropriate operational restrictions.

Effect of the Lease Stipulation

Some 238 blocks of the Western Gulf are in the area affected by the stipulation, 135 of which are already leased. Most of these 136 leases have a biological stipulation as a part of the lease. Therefore, this stipulation could affect 103 blocks (this number could change as a result of proposed Sale 98 (July 1985) or the relinquishment of currently active leases), if all are leased as a result of this proposal. These blocks represent 4.4% of the blocks offered in the Western Gulf. Except for the "No Activity Zones," however, this stipulation would not restrict drilling locations, and even the oil and gas resources below the "No Activity Zones" could be reached using directional drilling techniques.

Eight of these banks in the Western Gulf (29 Fathom, Baker, South Baker, Aransas, North Hospital, Hospital, Southern, and Dream) have been categorized by Bright and Rezak (1981) as somewhat less diverse and productive than the others, although still deserving protection. There is some question as to whether these banks require the protection of the "3 Mile Zone." This question will continue to be discussed and evaluated, especially in light of the study by the National Academy of Sciences (1983) funded by DOI which reviewed the literature on the fates and effects of drilling muds and cuttings in the marine environment.

A list of all blocks affected by the Topographic Features Stipulations may be found in Appendix A.

However, there are mitigating measures included in the proposal which, if imposed, would serve to reduce to nearly zero the impacts to coral and coral community areas from activities resulting from the proposed action. These measures are the lease stipulations which are described in Section II.B.1.c.(2). These stipulations would prohibit any oil and gas activities in the "No Activity Zones" of the shelf break topographic features (Visual No. 11) and would require various restrictions in the "1 Mile Zone" and the "3 Mile Zone" around these banks, such as shunting and/or monitoring. It must be remembered that the Flower Gardens are special cases because of the uniqueness and sensitivity of the biota found there. Because of public interest in the area, it is being considered for designation as a National Marine Sanctuary (Section I.B.6.a.); hence, the larger "No Activity Zone" (based on the 100 m isobath rather than the 85 m isobath (Figure I-3), and a "4 Mile Zone" instead of a "3 Mile Zone." Any accident releasing effluents or sediments concentrated sufficiently to travel the more than 1½ nmi to the coral reef could change the virgin biota characteristics of the bank and reduce its utility for research; a major accident could destroy the bank as a living example of the northernmost coral reef community in the Gulf. Such circumstances would diminish greatly the value of the area as a marine sanctuary, not to mention its value as habitat for biota of commercial, recreational, and aesthetic importance. The rationale for these zones is the same as for the other banks. This creation of a "No Activity Zone" will prevent the occurrence of any of the mechanical damage discussed above. This will eliminate the single most serious threat to coral reef and coral community areas: anchor damage (from oil and gas activities and fishing boats cannot be regulated by MMS) (Bright and Rezak, 1978b and 1981). Other mechanical damage due to oil and gas operations, such as rig, platform, and pipeline emplacement and smothering by drilling cuttings, will also be eliminated. Mechanical damage is probably the single most severe impact to benthic areas resulting from oil and gas operations. A "No Activity Zone" completely eliminates this threat to the area within the zone. The protection afforded by shunting all drilling effluents to very close to the bottom near high relief banks containing valuable biotic resources has been well-documented (Bright and Rezak, 1981). The potentially harmful materials (in drilling muds) are trapped in the bottom boundary layer and do not get up on the bank where the biota of concern are located. Shunting has been successfully utilized in the Western and Central Gulf since 1973 and is currently part of many active leases in these areas. Shunting would be required in the "1 Mile Zone." Monitoring would be required in the "4 Mile Zone" of the Flower Gardens. Either shunting or monitoring would be required in the "3 Mile Zone" of the other banks, except for the South Texas banks where shunting would be required in the "3 Mile Zone" for development operations only. For a more complete discussion of these stipulations, see Volume 1, Section IV.D.3.a.(2) of the Final Regional EIS.

Experience since 1974 shows that the stipulation, as presented herein, does work to prevent damage to the biota of these banks from the oil and gas activities resulting from the proposed action. The stipulation is part of the lease on most of the 136 blocks in the Western Gulf which are currently leased near these features, and the provisions of the stipulation have been invoked in some leases near these banks even in the absence of the stipulation. The provisions of the stipulation have been considered necessary by the Secretary in the past, and they are certainly sufficient to protect the biota of these banks. Furthermore, any oil and gas resources present under such areas could be recovered using directional drilling techniques. The stipulation would not, however, protect the banks from the adverse effects of an accident such as a large blowout on a nearby oil or gas operation. Fortunately, blowouts are rare in the Gulf.

(2) Cultural Resources Stipulation

The cultural resources stipulation is identical for the Central and Western Gulf, and applies to all blocks leased. See Section II.A.1.c.(3) for the stipulation.

(3) Military Areas Stipulation

The military stipulation has been applied in past sales to all blocks within each warning area. This stipulation is a measure utilized to mitigate the impacts of oil and gas activity on the military use. The warning areas and command headquarters for the WPA and CPA are given in Table II-2. See Figure I-5 for the military warning areas of the Western and Central Gulf covered by this stipulation.

The stipulation reads as follows:

Military Areas Stipulation
(Western Planning Area)

Hold Harmless

Whether compensation for such damage or injury might be due under a theory of strict or absolute liability or otherwise, the lessee assumes all risks of damage or injury to persons or property, which occur in, on, or above the outer continental shelf, to any persons or to any property of any person or persons who are agents, employees, or invitees of the lessee, its agents, independent contractors, or subcontractors doing business with the lessee in connection with any activities being performed by the lessee in, on, or above the outer continental shelf, if such injury or damage to such person or property occurs by reason of the activities of any agency of the United States government, its contractors or subcontractors, or any of their officers, agents or employees, being conducted as a part of, or in connection with the programs and activities of the command headquarters listed in Table II-2.

Notwithstanding any limitation of the lessee's liability in Section 14 of the lease, the lessee assumes this risk whether such injury or damage is caused in whole or in part by any act or omission, regardless of negligence or fault, of the United States, its contractors or subcontractors, or any of its officers, agents, or employees. The lessee further agrees to indemnify and save harmless the United States against all claims for loss, damage, or injury sustained by the lessee, or to indemnify and save harmless the United States against all claims for loss, damage, or injury sustained by the agents, employees, or invitees of the lessee, its agents, or any independent contractors or subcontractors doing business with the lessee in connection with the programs and activities of the aforementioned military installation, whether the same be caused in whole or in part by the negligence or fault of the United States, its contractors, or subcontractors, or any of its officers, agents, or employees and whether such claims might be sustained under a theory of strict or absolute liability or otherwise.

Electromagnetic Emissions

The lessee agrees to control his own electromagnetic emissions and those of his agents, employees, invitees, independent contractors or subcontractors emanating from individual designated defense warning areas in accordance with requirements specified by the commander of the command headquarters listed in Table II-2 to the degree necessary to prevent damage to, or unacceptable interference with, DOD flight, testing or operational activities, conducted within individual designated warning areas. Necessary monitoring control, and coordination with the lessee, his agents, employees, invitees, independent contractors or subcontractors, will be effected by the commander of the appropriate onshore military installation conducting operations in the particular warning area; provided, however, that control of such electromagnetic emissions shall in no instance prohibit all manner of electromagnetic communication during any period of time between a lessee, its agents, employees, invitees, independent contractors or subcontractors and onshore facilities.

Operational

The lessee, when operating or causing to be operated on its behalf, boat or aircraft traffic into the designated warning areas shall enter into an agreement with the commander of the individual command headquarters listed in Table II-2, upon utilizing an individual designated warning area prior to commencing such traffic. Such an agreement will provide for positive control of boats and aircraft operating into the warning areas at all times.

Effect of the Lease Stipulation

The electromagnetic emissions section of the stipulation requires the lessee and/or operator to reduce and even curtail within some areas the use of radio, CB, or other equipment emitting electromagnetic energy. This stipulation reduces the impact of oil and gas activity on the communications of military missions and reduces the possible effect of electromagnetic energy transmissions on missile testing, tracking, and detonation.

The operational section of the stipulation serves as a notification to the military of oil and gas activity to take place within a military use area. As oil and gas activity is about to take place within a warning area, the lessee and/or operator will notify the appropriate base commander for each warning area (Table II-2). The base commander then plans military missions and maneuvers to avoid the particular area in which the exploration rig will be drilling or to schedule around the area and time of day of service vessels and helicopter flights crossing the warning area.

This stipulation reduces the impact of vessel and helicopter traffic but does not mitigate the physical location, clustering, or separation of exploration rigs or platforms within a mission's flight pattern or maneuver area. Hence, the overall impacts for each warning area are not estimated to be mitigated sufficiently to cause a change in the level of expected impact, which is high within W-228 and low within W-602.

2. Alternative B - Delay Action

a. Description of the Alternative

While there are no known specific issues that might cause a delay at this time, it is possible that a delay could occur for reasons that may arise before the sales are finalized. Delaying the sales would withhold unleased blocks in the WPA for up to a 1-year period, or until a subsequent time on the 5-year schedule. Western Gulf sales are scheduled on an annual basis.

b. Summary of Impacts

As discussed in Section II.B.1., all impacts associated with the proposed action would be delayed until such time as the sale is reinstated.

3. Alternative C - No Action

a. Description of the Alternative

The alternative is equivalent to cancellation of a sale scheduled for a specific timeframe on the approved 5-Year OCS Oil & Gas Leasing Schedule. Sales in the Western Gulf are scheduled on an annual basis. Therefore, the opportunity is postponed or foregone for development of the estimated 0.10 billion bbls of oil and 1.34 tcf of gas that could have resulted from this sale in the Western Gulf. This no action alternative would be contrary to our National goal of expediting development of our domestic resources as a means of lessening our dependence on foreign oil.

b. Summary of Impacts

All impacts, positive and negative, associated with the proposed action (as discussed in Section IV.D.2.a.) would be cancelled and the importation of foreign oil at present or increased levels would be continued. There would be an increased environmental risk of oil spills caused by tankering the oil. Adverse socioeconomic impacts could include loss of employment opportunities, payroll revenues, and tax revenues. The economic stability of the coastal region could be negatively affected. Also, see Section IV.D.2.c. for a discussion of the development of alternative energy supplies as replacement sources for lost domestic production. Table IV-50 presents replacement energy equivalents for the estimated resources for this sale.

4. Comparison of Alternatives

Table S-3 provides a comparison and summary of the impact levels of the Proposed Action (Alternative A), the potential deletions (Alternative B-1), delaying the action (Alternative C), and no action (Alternative D), and cumulative impacts in the WPA. The definitions of the levels of impact for each alternative are located in Table S-4.

Alternative A (the proposed action), which includes committed biological, cultural resources, and military areas stipulations, has the potential to result in very low, low, or moderate impacts on all resource categories of concern with the exceptions of: the level of impact on cultural resources which could be very high in all areas (but for the fact that the risk of the impact actually occurring is low); and the level of impact on military warning area W-228 is expected to be high.

Alternative B, delaying the proposed action, would postpone any potential adverse impacts until a later time. The level of impacts would have to be evaluated at that time; however, the overall level of impacts on the resource categories are unlikely to change from those listed for the proposed action.

Alternative C, no action, would preclude any impacts to the resource categories listed in Table S-3 from the proposed action or other alternatives.

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SECTION III

DESCRIPTION OF THE AFFECTED ENVIRONMENT

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III. DESCRIPTION OF THE AFFECTED ENVIRONMENT

A. PHYSICAL ELEMENTS OF THE ENVIRONMENT

1. Environmental Geology and Hazards

a. Geology

The Texas and Louisiana shelf and slope are characterized by rapid rates of sedimentation into massive accumulations of silts, and clays, and numerous sand deposits in buried channels and small basins between uplifted domes. The area is absent of any major regional structures. However, thousands of smaller diapiric structures are present to influence the stratigraphy, sediment basin locations, and channel deposits.

The prospective horizons of the northwestern continental shelf are of Miocene, Pliocene, or Pleistocene age. The environment of deposition of the continental shelf and slope in the northern Gulf of Mexico is one of the most significant factors controlling hydrocarbon production. Sediments deposited on the outer shelf and upper slope have the greatest potential for bearing hydrocarbons due to the following reasons: (1) This is the location where nearshore sands interfinger with the deeper-water marine shales providing an optimum ratio of sandstone to shale. The shale may be the source rock that provides the oil and gas while the sandstone provides the reservoir into which the hydrocarbons migrate and are trapped; (2) In this environment, the organic material deposited with the fine-grained clays and muds is preserved, and not oxidized as it might be in shallower, more turbulent water; and (3) It is at this location that the increased overburden of the prograding shallow marine deposits over the plastic salt and marine shales initiates the salt flow that triggers the growth of salt domes and regional expansion faults which in turn provide traps for the hydrocarbons.

This environment, therefore, is the optimum zone for encountering the three ingredients necessary for the successful formation and accumulation of oil and gas: reservoir rock, source beds, and traps.

Offshore Louisiana sediments of Miocene and Pliocene ages are overlain by a thicker section of Pleistocene sediments derived from the Mississippi River system. The Texas shelf, during Pleistocene time, received smaller volumes of sediment because it was on the western border of the Mississippi River depocenter.

Since production of oil and gas frequently occurs along the continental shelf-slope break, the progradation of the north-central Gulf depositional regime has resulted in the migration of this production zone seaward and in the development of a series of progressively younger producing trends.

Future Pleistocene production from the upper continental slope region (200-1,000 m water depth) adjacent to the Texas-Louisiana OCS now appears probable with many discoveries recently announced in deeper waters. The continental slope includes all of the relatively steeply sloping seabed from the shelf edge to the abyssal floor. The prospective horizon of the upper slope may consist of a thin section of Miocene and Pliocene overlain by a thick section of Pleistocene age. The Pleistocene sediments are considered the most prospective reservoir beds. The structural grain and hummocky topography of the slope are controlled primarily by salt tectonics. Virtually the entire province is underlain by gigantic salt stocks and swells.

Basinal areas between salt structures of the upper slope contain a thickness of as much as 3,500 m of sediment, most of which appear to be muddy, slump deposits with infrequent turbidite sand zones. It has been speculated that turbidite sands of reservoir quality could be present on the upper slope, especially in deposits of Pleistocene age.

b. Geologic Hazards

Within the Gulf of Mexico, major geohazards to oil and gas development are associated with seafloor geologic features which result in seafloor instability. Primarily, the hazards are produced by: (1) increased gradient at the edge of the continental shelf where it merges with the continental slope; (2) regional high rates of deposition on the continental shelf that cause isostatic adjustments and deep-seated gravity faulting; (3) local high rates of unconsolidated sediments deposited on the increased gradient of the continental shelf edge that has led to intensive slumping and mudslides; (4) diapiric movement of low density material through overlying sediment that has caused extensive deformation, the damming of sediments, gravity faulting, and slumping; and (5) high biogenic gas content in rapidly deposited sediments.

These seafloor instabilities present limitations and necessitate adaptations in the siting, structural engineering, and routing of pipelines, exploratory drilling, and production platforms.

Most structures and equipment used for minerals exploration and development can be designed to withstand the stresses of the continental shelf environment if adequate information is available. Studies developed under MMS's Environmental Studies Program have been especially directed toward areas where more detailed geologic information was needed for intelligent management of the OCS mineral leasing program. Visual No. 5 shows the areas where MMS/BLM geologic studies have provided detailed information and mapping.

The comprehensive investigations of the continental shelf have been conducted in order to develop a baseline inventory of geological and biological data for future environmental monitoring. The program was designed to provide basic scientific data necessary to assess and predict problems and potential impacts resulting from energy, mineral, transportation, recreation, and industrial development on the Federal OCS.

These studies have provided assessments of operational constraints to oil and gas exploration and production. The data and mapped information are being utilized on a daily basis for tract evaluation, stipulation development and application, pipeline permit processing, protection of sensitive areas such as the Flower Garden Banks, preliminary platform emplacement, and pipeline routing.

BLM/MMS Open File Report 80-02, section entitled "Oil and Gas Developemnt in the Mississippi River Delta Mudslide Area," (Handley, 1980), cites several examples of the application of geologic studies and geohazard surveys to recent platform siting and pipeline routing in that particularly unstable seafloor environment.

c. Non-Oil and Non-Gas Mineral Resources

Several minerals in the Central Gulf of Mexico now are, or have the potential to become, commercially exploitable. Deposits of quartz sand in Federal and State waters off the coasts of Mississippi and Alabama are of interest because of their potential use in the production of glass. Sulphur and salt deposits associated with the thousands of diapiric and domed structures in the OCS seafloor have mining potential. Although there are five active leases in OCS waters, none of these leases are currently producing, and a new sulphur or salt lease has not been issued since 1967. Presently, supplies onshore and within State waters preclude the future development of OCS deposits.

In the Western Gulf of Mexico there are no known nonpetroleum mineral resources presently of interest or of economic value.

2. Meteorological Conditions

The Gulf of Mexico and adjacent coastal areas are part of the Atlantic tropical cyclone basin, which is one of six such geographical areas on the earth influenced by tropical cyclones. Because of its extensive coastal region and almost complete enclosure by land, the Gulf is also a favorable region for the development of atmospheric disturbances associated with land and sea surface temperature contrasts. As population and industrialization increase in hurricane prone areas, the assessment of risk of damage is important for planning purposes. Since the unpredictability of hurricane events precludes a stable climatological summary of the risk of storm recurrence at one locality, the probability of occurrence may be used. Based on climatological averages, this provides a reliable guide (USDI, BLM, 1980). Tables III-1, III-2, and III-3 of the Final Regional EIS summarize the local weather conditions for the offshore area of the Eastern, Central, and Western Planning Areas. For additional information concerning meteorological conditions, see Visual No. 6 and Volume 1, Section II.A.2. of the Final Regional EIS.

3. Physical Oceanography

Physical conditions in the Gulf of Mexico can be characterized as dynamic, yet not extremely harsh. Extreme physical conditions are infrequent; however, they can occur throughout the year. Summer and early fall offer possibilities that tropical storms may affect the area through characteristically high winds (18+ m/sec), waves (7+ m), and storm surge (3-7.5 m). Tables 8-10 on Visual No. 6 indicate recurrence intervals of storms, extreme winds, and extreme waves. Winter storm systems frequently cause moderately high winds, waves, and storm conditions that occasionally mask local tides. These conditions, while sometimes harsh, do not have the potential to create extreme conditions as harsh as those associated with tropical storms.

Tables 11 and 12 on Visual No. 6 show the distribution of wind speed over the entire Gulf of Mexico for the summer and winter seasons as observed by the National Aeronautics and Space Administration (NASA). Note that the data for the summer season are strong in the 2-6 m/sec range where the winter season is dominant over a wider range of 2-12 m/sec. One other noticeable point on Table 11 (summer) is that as higher wind speeds are approached, the frequency then diminishes to near zero at 12 m/sec, yet jump slightly farther out on the table at 16 m/sec. This is indicative of the virtual lack of extreme winds during summer except those associated with tropical storm activity.

Tables 14 and 15 on Visual No. 6 indicate that wave heights during both the summer and winter seasons are dominant in the 0-3 m range with a slight shift in dominance towards larger wave heights during the winter season. This correlates with observations of Tables 11 and 12 on Visual No. 6.

Tables 1-7 on Visual No. 6 display annual windspeed, wave height, visibility, and other pertinent weather statistics for specific Synoptic Meteorological Observation Areas (outlined on front of the visual) throughout the Gulf.

A generalized pattern of surface circulation for the Gulf of Mexico has been presented on Visual No. 6 for winter and summer seasons. These circulation patterns can in no way represent either the direction or speed of currents in a given area at any specific time due to the extreme variability in the factors that control these parameters. The factors controlling circulation in the Gulf are very dynamic in nature and as such do not produce any constant condition, but one that is always changing due to the many influences. Visual No. 6 is helpful, however, in aiding the reader to understand, in general, the outcome of the major influences at work since it is derived by averaging many years of observations from mariners and scientific investigators.

The Gulf can be characterized by two interrelated systems, the offshore or "open Gulf" and the "inshore Gulf" (shelf area).

The large-scale circulation in the open Gulf is influenced by the Loop Current and associated eddies, the semipermanent gyre in the Western Gulf, winds, waves, freshwater input, and the density structure of the water column. The physical location of the Loop Current is in the Central and Eastern Gulf, but through a process of growth and decay, the Loop Current protrudes to varying degrees into the northern section of the Eastern and Central Gulf. Also, during the growth cycle, the Loop sheds anticyclonic eddies which frequently influence the circulation in the northeastern portion of the Gulf and often travel southwestward across the Gulf in a process of decay that typically lasts 4-10 months.

The Loop Current is a very distinct and prominent feature in the Gulf. It is formed as the Yucatan current enters the Gulf through the Yucatan Straits and travels a variable path through the Eastern and Central Gulf before exiting the Gulf and merging with other water masses to become the well-known "Gulf Stream." Figures 1-4 on Visual No. 6 show frequency analyses by month of the location of Loop Current water. Variability in the location of the Loop Current is large even though average positions between months do not greatly differ. Investigations suggest that an excess of inflow of Yucatan current water on the order of $4 \times 10^6 \text{ m}^3/\text{S}$ (in the upper 500 m of the water column) is required over and above the outflow through the Straits of Florida to make the Loop Current grow.

Studies have shown that the Loop Current has an 8-10 month cycle of growth and decay; however, the variability in patterns from year to year is significant. Although the Loop Current intrusion/eddy formation cycle occurs on an approximately annual period, recent studies show maximum Loop penetration into the Gulf can occur during any season. Figure III-3 of the Final Regional EIS shows a plot of the northernmost position of the Loop Current versus time for the period January 1973-July 1977.

Figure III-3 of the Final Regional EIS further shows a sequence of events which leads to the formation of a major feature in the Gulf, a large warm gyre. This event normally occurs after there is a surge of Yucatan current water in the Gulf that pushes the Loop Current farther north. A very large "meander" (composed of cool shelf water) grows significantly in the cross shelf direction off the West Florida shelf, extending hundreds of kilometers out from the shelf break, becoming more and more elongated. Eventually, the "meander," taking the form of a cold intrusion, extends the entire width of the Loop Current. When this happens, the Loop Current reestablishes itself farther south and what used to be the upper lobe of the Loop Current retains its momentum, establishing itself as a large warm gyre with strong clockwise circulation.

It appears that the major warm gyres typically follow one of three courses of action after formation: (a) the surge of Yucatan current water may again push the Loop Current water north, reestablishing itself with the gyre; (b) if the gyre was not strong when it was established, it may quickly disestablish; and (c) if the structure of the gyre is strong (thermally), it may move slowly from its position in the northeastern Gulf through the Central Gulf and dissipate many months later in the Western Gulf or possibly break into smaller gyres prior to extensive lateral movement. The major gyres described often have a diameter of approximately 400 km, whereas the minor gyres in this area are on the order of 200 km in diameter (Vukovich et al., 1978).

As previously stated, another major feature influencing Gulf circulation is the presence of an anticyclonic gyre (recently thought to be a permanent feature) existing in the Western Gulf. Data in this area of the Gulf have been insufficient to fully define the character of this feature; however, its presence seems to be indicative of a permanent feature. It is thought by investigators that the gyre is fed by the Loop Current eddies that drift into the region, and also by wind stress. For additional information refer to "An Environmental Guide to Ocean Thermal Energy Conversion (OTEC) Operations in the Gulf of Mexico" (USDC, NOAA, 1983).

Gulf of Mexico tides are small and noticeably less developed than many other coastal areas of the Atlantic or Pacific states. The ranges of tides throughout the Gulf are typically on the order of 0.3-1.2 m depending on the location and time of year. The type of tide differs considerably throughout the Gulf. In some locations the tide is of a diurnal nature while in others it may be semidiurnal or both.

Note that Figure III-7 of the Final Regional EIS shows the different types of tides (diurnal, semidiurnal, and mixed) throughout the Gulf. The major tidal variations are keyed to the declination of the moon. There are inequalities which yield a mixed tide from some particular areas and considerable inequality in the heights of high and low waters with a difference of only a few tenths of a foot at times.

The shelf circulation in the Central Gulf is influenced mostly by tides, local winds, and freshwater discharge from local river systems. Although the tides and the winds are not typically strong (0.5 m and 8 m/sec, respectively) except during the occurrence of an extreme event (tropical storm), the combined effect of wind and tide produce irregular and unpredictable circulation that can be quite strong. Off coastal Alabama, studies have found the alongshore motion to be predominantly wind-driven. The year-to-year variability in the wind makes a net flow in either alongshore direction possible. When the alongshore motion has been observed in the easterly direction, there has been a persistent offshore motion observed also (Chuang et al., 1982). Other phenomena, such as high volume river discharge, has been associated with onshore (cross shelf) motion in several areas.

Studies of the Mississippi Sound area show the long-term averages of surface and bottom currents as indicators of circulation. In the passes between barrier islands, mean surface flow is out of the sound and bottom currents are either weak (in the same direction) or directed into the Sound. The circulation in the Sound is thought to be dominated by several horizontal circulation gyres, clearly undefined to date. For more information, see "Mississippi Sound and Adjacent Areas," U.S. Dept. of the Army, Corps of Engineers (1983). Other studies off the Mississippi River indicate that Loop Current activity occasionally influences and induces high velocity currents to approximately 300 m in the immediate area. Refer to OTC 4322 and Collipp et al. (1975). It has also been suggested that the Loop influences shelf circulation off the Alabama coast.

A major storm event such as a hurricane or tropical storm can have unpredictable influence on local circulation at or near its path. Hurricanes Bob and Claudette passed near the Flower Garden Banks during a recent MMS study. The response to these storms was an abrupt change in current direction and an increased current velocity (near bottom) to greater than 20 cm/sec marked with weak and strong oscillations (10 cm/sec). For additional information, see "Draft Final Report - Northern Gulf of Mexico Topographic Features Monitoring and Data Synthesis" (USDI, MMS, 1983c).

Studies of the Louisiana and Texas shelf imply that the circulation on the Louisiana shelf is actually part of a more extensive system. The currents in this area have been found to be more persistent than local wind, implying outside influence. The well-known westerly/southwesterly flow along the Louisiana inner shelf progressing along the Texas shelf in a more southerly direction is thought to be the coastal portion of a closed cyclonic circulation pattern covering much of the Louisiana and Texas shelf. A long, narrow region of cool water represents the ridgelike center of the cyclonic feature. The outside edge of the cyclonic feature is thought to be evidenced by predominant easterly currents found at the shelf edge near the Flower Garden Banks. The easternmost side of the cyclonic feature is largely unstudied. Figure III-1 is representative of the features described above for alternate months. For additional information, see DOE, West Hackberry Strategic Petroleum Reserve Site Brine Disposal Monitoring, Year I, Report Volumes I and II (1983).

For a more detailed description of physical oceanography, see Volume 1, Section III.A.3. of the Final Regional EIS.

4. Chemical Oceanography

The chemistry of the Gulf of Mexico reflects the varying impacts of regional forcing agents, such as the Loop Current and Mississippi River, as well as basin-scale hydrographic characteristics derived from waters entering the Gulf through the Yucatan Strait. For a detailed discussion of the chemical and hydrographic regimes of the Gulf planning areas, see Volume 1, Section III.A.4. of the Final Regional EIS.

Recent information provided by Morrison (Proceedings . . . 1982, p. 154) on the hydrographic characteristics of Western Gulf deep water necessitates a revision of the water mass divisions given in the prior section on subsurface water mass hydrography, which can be correctly summarized in Table III-1.

5. Water Quality

Water quality is based upon numerous factors, including currents, freshwater inputs, nature and number of discharges, outfalls, and human activities that consist of municipal and industrial waste discharges, runoff, oil spillage, dredging, etc. In the past, water quality has been defined as the degree to which chemical concentrations and physical parameters within a water mass approach the ambient water state. Offshore water quality degradation in the Gulf of Mexico is associated primarily with effluent discharges by current offshore enterprises, consisting of OCS activities and marine transportation sources. Coastal or onshore water quality varies and is determined by river outflows into the Gulf, primarily the Mississippi River. The Mississippi River has the greatest impact on the Gulf's water quality and is the most significant source of

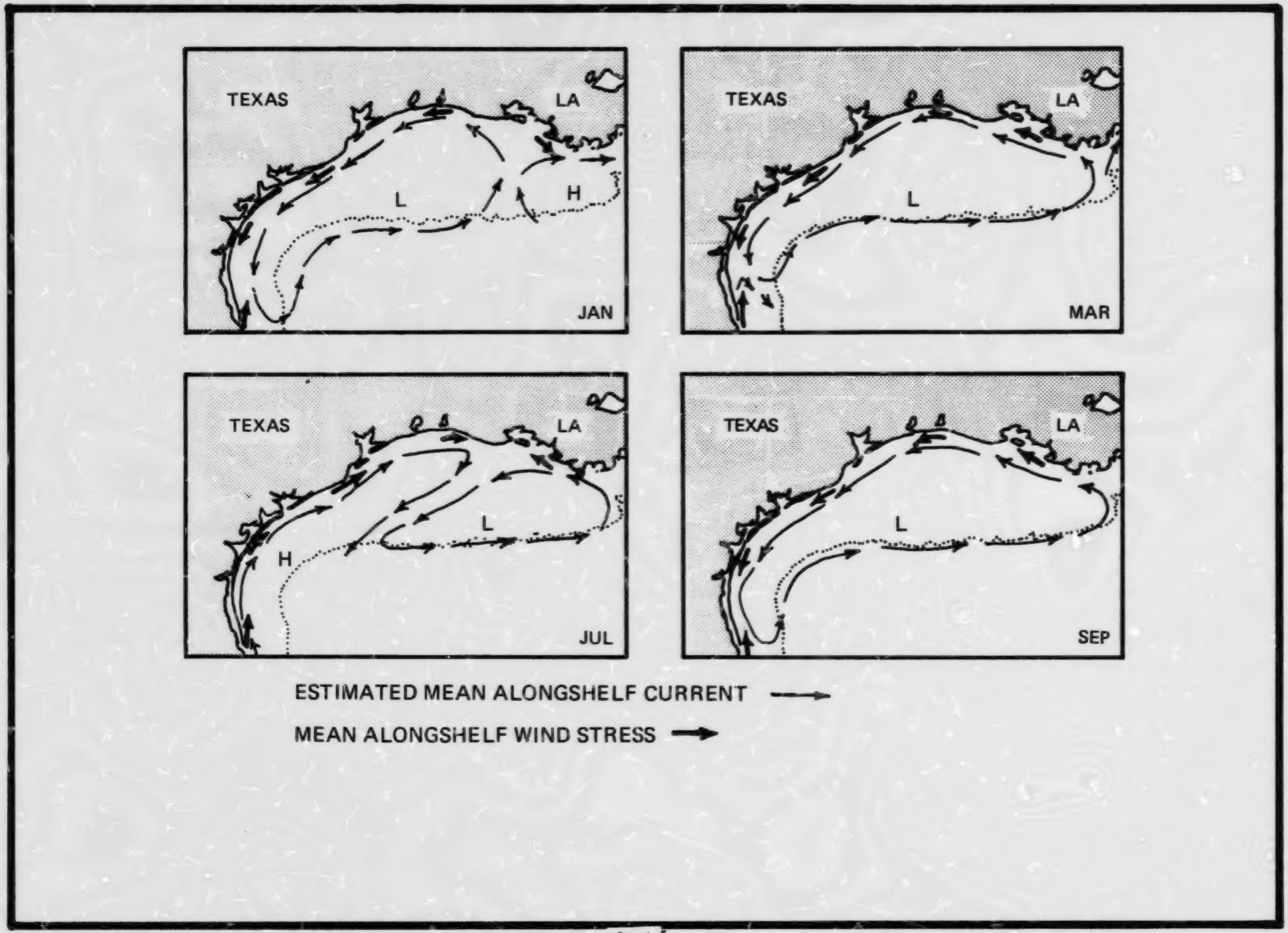
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Figure III-1. Cyclonic Circulation Patterns.

Table III-1

Water Property Extremes in the Gulf of Mexico

Water Mass	Extreme	Concentrations	Depth Range (m)	Location
Gulf Water	Salinity maximum	36.4-36.5 ppt	0-250	Gulfwide
Subtropical Underwater (SUW)	Salinity maximum	less than 36.8 ppt	100-300	Eastern Gulf*
18° Sargasso Seawater (18° SSW)	Oxygen maximum	(small and variable)	200-400	Eastern Gulf*
Tropical Atlantic Central Water	Oxygen minimum	2.5-2.9 ml/l	250-400	Gulfwide
Antarctic Intermediate Water	Nitrate maximum	29-35 ug-at/l	500-700	Gulfwide
Antarctic Intermediate Water	Phosphate maximum	1.7-2.5 ug-at/l	600-800	Gulfwide
Antarctic Intermediate Water	Salinity maximum	34.88-34.89 ppt	700-800	Gulfwide
Mixture of North Atlantic Deep Water and Carribbean Mid-Water	Silicate maximum	24-28 ug-at/l	1,000-1,100	Gulfwide

* SUW may occasionally be found in the Western Gulf in eddies detached from the Loop Current. There have also been indications of 18° SSW in detached eddies, but the evidence is slight.

pollution to this area. The existing water quality of the coastal regions of the Gulf is briefly discussed below. For a more detailed discussion of water quality, see Volume 1, Section III.C.10. of the Final Regional EIS.

Central Gulf of Mexico

The Central Gulf region is characterized by many water quality problems that are affected by the discharge or release of industrial wastes and domestic sewage into its rivers, bays, and estuaries. The most significant source of pollution in this area is the outflow from the Mississippi River which drains more than 5.5 Mkm^2 or 41% of the lands of the continental United States. This drainage results in the presence of high bacterial concentrations and toxic pollutants within the Mississippi River area and is evidenced by high levels of organic pollutants found in its deltaic sediments. Other contributions to water quality problems within this region stem from increased land clearing activities associated with agriculture, industry and urbanization, dredging and disposal of dredge spoils, and industrial/domestic pollution from numerous point source discharges along the coast. These activities have led to the eutrophication of several coastal water bodies in Louisiana and the permanent and temporary closure of many shellfisheries in the region.

Western Gulf of Mexico

The Texas coastal area has been plagued with numerous water quality problems in the past. Degradation of water quality has occurred from many sources, including domestic and industrial effluents, dredging operations, agricultural runoff, shipping, offshore operations, etc. The majority of these water quality problems occur in the Houston-Galveston and Beaumont-Port Arthur areas where the majority of Texas' energy facilities are located. Utilization of the Houston ship channel and the Sabine-Neches River complex as effluent receiving systems has seriously impacted the water quality of these systems and the surrounding areas. However, an effort has been made in the last several years to clean up these systems with an upgrade of industrial and municipal waste treatment systems, hence lessening the water quality degradation experienced in the past. Although the area between Sabine Pass and Lavaca Bay has been beset by numerous water quality problems, the majority of Texas coastal river basins exhibit acceptable water quality (Texas Water Quality Board, 1976 and Texas Department of Water Resources, 1983).

6. Air Quality

The air quality of the coastal area along the Gulf of Mexico varies considerably by local area; however, even with some violation of NAAQS, it is generally considered to meet standards and in many areas is better than the Standards. Table III-2 describes the affected environment for air quality concerns throughout the Gulf coastal region by showing the counties in each state that are classified as nonattainment areas relative to the primary and/or secondary NAAQS and by listing PSD Class I areas in each state. Note that in the Central Gulf coastal area Mississippi has not been classified as a nonattainment area. For further information, refer to 40 CFR 81.3 and 81.4 and Volume 1, Section III.C.11. of the Final Regional EIS.

B. BIOLOGICAL RESOURCES

1. Coastal Habitats

The following habitats are characteristic of the Gulf coast: forested wetlands, non-forested wetlands, seagrass beds, mangroves, barrier bays, and islands. The habitats are presented in the general order of occurrence beginning inland and proceeding to the Gulf. These habitats may occupy narrow bands or vast expanses and can consist of sharply delineated zones of different plant communities, monotypic stands of single species, or mixed plant species communities.

Table III-2

Nonattainment and PSD Class I Areas throughout the Gulf Coastal Region

Nonattainment Areas	TSP	SO_2	O_3	CO	NO_2
Central Gulf of Mexico					
Louisiana					
St. John the Baptist Parish			X		
Orleans Parish			X		
Jefferson Parish			X		
St. Bernard Parish			X		
St. Charles Parish			X		
Lafourche Parish			X		
St. Mary Parish			X		
Alabama					
Mobile County	R		X		
Western Gulf of Mexico					
Texas					
Cameron County	X				
Nueces County	X		X		
Galveston County			X		
Jefferson County			X		
Brazoria County			X		
Harris County	X		X		

Note: X = Does not meet primary standards
XX = Does not meet secondary standards
R = Does not meet primary or secondary standards

PSD Class I Areas	
Central Gulf of Mexico	
Louisiana	Breton Wilderness Area
Alabama	None
Mississippi	None
Western Gulf of Mexico	
Texas	None

Source: 40 CFR 81.3 and 81.4, July 1983.

Coastal wetlands are characterized by high organic productivity, high detritus production, and efficient nutrient recycling by retarding coastal erosion and land loss; and by providing habitats for a great number and wide variety of invertebrates, fish, herptiles, birds, and mammals.

The inland band of habitat is usually forested wetlands and extends from the uplands to the non-forested wetlands. Forested wetlands consist of moist to saturated soils supporting mixed forest and scrub shrub communities. The hydrologic pattern ranges from permanently flooded to seasonally flooded, usually in response to associated river systems and tidal fluctuations. The topography is flat and a very slight change in elevation results in changes in plant and animal communities. Predominant trees are bald cypress, tupelogum, ash, oaks, elms, and numerous shrubs.

Forested wetlands provide habitat for a wide variety of animals. These wetlands are important nursery and production areas for finfish and shellfish harvested for sport and commercially. Forested wetlands provide feeding, nesting, and wintering habitat for migratory and nonmigratory birds. Populations of birds and mammals harvested for sport and commercially are often highest in forested wetlands.

Non-forested wetlands occur seaward from forested wetlands and landward from barrier islands and open bays. The topography is flat, soils saturated, and plant communities consist of emergent grasses, forbs, shrubs, and a few trees. Non-forested wetlands are interlaced with bayous, rivers, small ponds, and slight ridges.

The hydrologic regime ranges from permanently flooded to seasonally flooded in response to associated river systems and tidal fluctuation. Non-forested wetlands are among the most productive habitats on earth because of the combination of fertile alluvial soils, periodic flooding and dewatering, fresh to saline condition, and extensive exposure to sunlight. Predominant plants are marsh cordgrasses, rushes, sedges, arrowheads, several fleshy halophytes on the exposed soil and eelgrass, widgeon grass, and wild celery in open water. Trees and shrubs include oaks, groundsel tree, wax myrtle, and buttonbush.

Non-forested wetlands provide habitat for a wide variety of finfish, shellfish, birds, mammals, and herpetofauna. These wetlands are extremely important nursery areas for the brown shrimp, white shrimp, spotted seatrout, red drum, flounder, gulf menhaden, and Atlantic croaker. Birds, including herons, egrets, ibises, migratory ducks, geese, and rails, are heavily dependent on these wetlands for wintering habitat. Furbearing mammals, including the nutria, river otter, mink, and muskrat, occur in and are commercially harvested from the wetlands. These wetlands are the major producers of finfish and shellfish harvested for sport and commercially in the estuarine zone of the Gulf. Non-forested wetlands are the principal site of the popular sport of duck and goose hunting along the Gulf coast.

The open bays and associated passes occur seaward from the non-forested wetlands and landward from the barrier islands. Open bays are shallow bodies of estaurine water ranging in salinity from near sea strength in fall to slightly brackish in spring and winter. Water bottoms range from coarse sand to fine clays and silts; some are colonized with submerged vegetation. Extensive seagrass beds occur in the open bays. The open bays are interconnected with passes, bayous, and rivers, and are often bordered on the seaward side by barrier islands.

Open bays are extremely important production and harvest areas for white shrimp, brown shrimp, spotted seatrout, red drum, flounder, and American oyster. These wetlands are heavily used by migratory waterfowl, principally diving ducks, gulls, terns, skimmers, and numerous species of less abundant shorebirds. Open bays are a major site of recreational fishing, boating, and swimming.

Barrier islands are located along the seaward edges of open bays. These islands are long sandy beaches with dunes, a few trees, and limited non-forested wetlands. Barrier islands are the initial beachfront contact of wave action from the Gulf. The islands extend from several feet to less than a mile in width and from a few hundred yards to 100 miles in length. Most of them do not rise more than 10-15 ft above sea level. Wave, wind, and tidal forces shape the barrier islands. Beaches and dunes migrate in response to fluctuations in seasonal and cyclic wave patterns, storms, and hurricanes.

The flora and fauna of the typical Gulf coast barrier island is diverse. On the coastal side of these islands, non-forested wetlands supporting marsh cordgrasses, saltwort, and sea oxeye are found. On the Gulfside, dune vegetation including sea oats, saltgrass, and groundsel tree are present. Further inland, several species of pines and oaks may be present.

Barrier islands provide habitat in the form of nesting, feeding, and resting areas for many species of shorebirds, wading birds, and seabirds. Gulf beaches of barrier islands provide nesting habitat for sea turtles.

Seagrass beds are usually located between barrier islands and the non-forested wetlands in shallow open water. They consist of rooted aquatic vegetation that may or may not extend to the water surface. Predominant plant species are wild celery and turtle grass. Seagrass beds provide nursery, feeding, and escape habitat for many species of finfish, shellfish, and microorganisms. Migratory waterfowl, principally diving ducks, feed over seagrass beds.

The habitats described above are categorized for descriptive purposes. Ecologically and biologically the interaction of these habitats within the coastal zone is important. No habitat category functions independently of another and any alteration of one could and probably does have an impact on the others.

Collectively, the coastal zone of the Gulf of Mexico is one of the most productive habitats in the world. The central source of this productivity is the forested and non-forested wetlands. Table III-3 outlines the acreage of habitats along the coast.

Table III-3

Habitat Acreage for the Central and Western Analysis Areas

	Planning Areas	
Habitat	Central	Western
Bay	2,606,180	1,638,265
Barrier Island	42,836	194,650
Seagrass Beds	72,068	290,919
Forested Wetlands	981,493	73,418
Non-Forested Wetlands	3,393,695	875,245

Most of the coastal wetlands in the Gulf coastal plain are located in Louisiana, in association with the Mississippi River deltaic plain. This deltaic plain is characterized by cyclical episodes of delta growth, erosion, and environmental change. Wetlands in coastal Louisiana are usually established on a substrate of alluvial sediment that is subject to high, natural subsidence rates (Gagliano et al., 1981). The effects of natural subsidence are compounded by sea level rise, which has been occurring during the past several millennia. Under natural conditions, sedimentation encourages vertical accretion of wetland areas and may offset the submergence and inundation that result from subsidence and sea level rise.

During historic times, the natural deltaic processes and balance of sedimentation and submergence have been interrupted by extensive alterations in the hydrology of the Mississippi River basin and delta. These interruptions are implicated in the extensive wetlands changes that have occurred in this century. These changes include shifts in wetland habitats and conversion of marsh to open water.

The deterioration of coastal wetlands, particularly in Louisiana, has become an issue of concern. In 1980, the projected amount of marshes that would be converted to open water was 50 square miles in coastal Louisiana. Additional discussion of the issue of wetlands loss is included in Sections IV.D.1.a.(1) and IV.D.2.a.(1).

The importance of the coastal wetlands to fish and wildlife resources is well-documented. FWS studies indicate that Louisiana contains 40% of the vegetated coastal wetlands in the conterminous United States and 64% of the tidal marshes along the Gulf of Mexico. The Louisiana coastal wetlands support over two-thirds of the Mississippi Flyway wintering waterfowl population (including 20%-25% of North America's puddle duck population) and the largest fur harvest in North America (from 40%-65% of the Nation's total per year) (Olds, 1984).

Approximately 150 active colonial bird nesting sites have been observed in those wetlands and the alligator population presently exceeds 500,000 (Olds, 1984). Approximately three fourths of the estimated 1982 Gulfwide harvest of 2.3 billion pounds of commercial fishes and shellfishes valued at $114 million were landed in Louisiana (Olds, 1984). In 1979, recreational fishermen in Louisiana made 3 million trips in pursuit of marine and estuarine species, expending an estimated $54.5 million in that effort (Olds, 1984).

2. Offshore Habitats

The discussions of offshore habitats in Volume 1, Section III.B.2. of the Final Regional EIS and in Section III.B.2. of Final EIS's 81/84 and 94/98/102 provide the available information regarding biological communities that might be impacted by offshore oil and gas operations. Particularly sensitive areas of the Central Gulf are listed and discussed on pages 179-181, and such areas in the Western Gulf are discussed on pages 181-182 in Volume 1 of the Final Regional EIS. Stipulations to protect these areas from potential adverse impacts from oil and gas activities are described and discussed in the appropriate subsections of Sections II and IV of this EIS.

A summary of the information discussed in Volume 1, Section III.B.2. of the Final Regional EIS and in Section III.B.2. of Final EIS's 81/84 and 94/98/102 mentioned above follows.

That portion of the offshore biota most likely to be affected by oil and gas activities resulting from these two proposals is the benthos; furthermore, benthic communities are far better known than other offshore communities.

"Habitats" include the water column; although a number of studies have been conducted on biota of the water column, generalizations are not possible because of the patchy nature of biotic distributions. Phytoplankton and zooplankton, for instance, are distributed in patches of various sizes which move with the prevailing winds and currents. Other factors, poorly understood, affect the size and distribution of the patches, including the availability of nutrients and grazing pressure; therefore, predictions regarding specific locations of a patch or species at any given time simply cannot be made.

Habitats also include man-made structures, such as oil and gas structures which act as artificial reefs. Gallaway and Lewbel (1982) documents the rich and valuable biological communities found on such structures in the northwesten Gulf of Mexico. The report concludes that the artificial reef communities of petroleum platforms represent a valuable biological resource in the northwestern Gulf of Mexico, one that will ultimately be lost due to the legal mandate that the platforms be removed when they are no longer productive. Gallaway recommends that strategic groups of platforms be preserved by the government for public and ecological benefit. See also Section IV.D.1.e.

Darnell et al. (1983) surveyed selected individual species in the Central and Western Gulf (from the Mississippi River Delta to the Rio Grande) and prepared maps detailing the spatial and temporal distribution and life history patterns of these animals. Several general patterns emerged from this study:

(a) The demersal shelf fauna fall naturally into four basic classes: nearshore, mid-shelf, outer shelf, and trans-shelf groups.

(b) Seasons of peak abundance differ from species to species, with spring having the fewest and fall having the most species showing peaks.

(c) Seasonality also occurs shown in distributional expansion, high density, rareness or absence, and depth-related shifts in distribution and/or density.

(d) Coastwide distribution patterns were also noted, such as regional dominance, aggregation off passes, population insularization off Texas, and seasonal concentration near the Mississippi and Rio Grande River mouths.

For details of Darnell et al. (1983), see the expanded summary in Final EIS 81/84.

Nekton for the offshore waters are represented by five major taxonomic categories--marine mammals, reptiles, fishes, cephalopod mulluscs (octopuses and squid), and certain crustaceans (shrimp and swimming crabs). Individuals of this group commonly, but not always, range over broad areas. However, most nekton are limited to geographic and vertical ranges by the same environmental conditions as less mobile organisms, i.e., temperature, salinity, and available food.

Most of the northern Gulf fishes are temperate with incursions of Caribbean faunas, and exhibit seasonal distribution and abundance fluctuations, which are probably largely related to oceanographic conditions.

Studies by Bright and Cashman (1974), Causey (1969), and Walls (1973) have been conducted concerning the fish fauna of offshore banks (hard substrates) of the north, central, and western Gulf of Mexico. Sonnier et al. (1976) made observations, photographs, and collections of fishes on the western reefs of the Louisiana OCS and around oil platforms and verified the presence of an extensive tropical fish fauna. Of 105 species recorded, about 50% were tropical species either unreported or rarely reported from the northwestern Gulf. More species were found around reefs than oil platforms, although a number were common to both.

Sonnier et al. (1976) also found that platforms generally show a lesser growth of epifauna than the reefs, suggesting fewer niches. This estimate of 49 species occurring on platforms and 93 species on the reefs also reflects that the platforms studied were inshore of the deeper reefs and subject to greater water temperature fluctuations.

The benthic communities of the OCS are distributed largely by sediment type and water depth. Other factors which contribute to the control of the occurrence of benthic organisms are salinity, temperature, currents, and food availability. Defenbaugh (1976) has delineated 12 different benthic zones from his studies of the continental shelf off Pensacola, Florida, to Brownsville, Texas.

The benthos has both floral and faunal components, the floral representatives being algae and seagrasses. The abundance of benthic algae is limited by the scarcity of suitable rocky substrates and light penetration. Bright and Rezak (1976) have recorded algae from submarine banks off Louisiana and Texas. In exceptionally clear waters, benthic algae are known to grow in water depths up to at least 183 m, especially coralline red algae, and noncoralline red algae as well (Humm, 1973).

Offshore seagrasses are not conspicuous in the Western Gulf; however, fairly extensive beds may be found in estuarine areas behind the barrier islands. Humm (1973) states that seagrasses would be continuous around the entire periphery of the Gulf if it were not for the adverse effects of low salinity and turbidity of the Mississippi River effluent from the delta to Galveston. Seagrasses are more estuarine and common in the Eastern Gulf, especially in the Big Bend area of Florida and off the southwest Florida coast.

The benthic faunal representatives offshore include almost all animal phyla. The benthic fauna is composed of infauna (animals that live in the substrate such as burrowing worms and mulluscs) and epifauna (animals that live on the substrate such as molluscs, crustaceans, hydroids, sponges, anemones, and corals). The commercial shrimps, Penaeus spp., and demersal fishes are closely associated with benthic communities. The commercially important demersal fishes include flounders, snappers, groupers, and croakers.

The slope is a transitional environment influenced by processes on the shelf and the abyssal Gulf. This transition applies more to the pelagic than to the benthic realm. The lower boundary of the euphotic zone is about 50-60 m; thus, the entire slope is in darkness. The lower limit of light penetration may be taken as the lower depth limit of photosynthetic activity of phytoplankton. The general conclusions which may be reached are as follows: (a) the shelf phyto- and zooplankton are more abundant, more productive, and seasonally more variable than the open

Gulf plankton; (b) in these respects, the slope plankton is intermediate but closer to the condition of the open Gulf; and (c) each of the three regions is characterized by some species which are more or less specific to the particular zones. Some east-west differences have been noted, especially among the diatom species. These have also been interpreted as representing the differences between normal Gulf waters and those influenced by Mississippi River water. The planktonic biota of the surface waters may be viewed as primarily transitional between that of the shelf and that of the deep Gulf; such is not the case with the benthic fauna. Most of the benthic inhabitants of the slope are found elsewhere, and together they constitute a complex, abundant, true slope fauna (Pequegnat et al., 1976).

The deep-sea area of the northern Gulf of Mexico is much less well-known than the shelf. However, Pequegnat (1983) has recently reported his observations based on 264 oceanographic stations between 150-3,850 m in an area including the DeSoto and Alaminos Canyons, the Mississippi Trough and Fan, and the Sigsbee Abyssal Plain (Visual No. 9).

The deep Gulf ecosystem is a complex of water and bottom extending from the Mexican border to and including DeSoto Canyon off the Florida panhandle. With the exception of the vicinity of hard banks at the edge of the continental shelf, the sediments are of terrigenous origin. Actually, DeSoto Canyon marks the northern contact of clastic sediments with carbonate sediments to the east, just as to the south Campeche Canyon runs along a similar contact of clastics with the great carbonaceous Campeche Bank which runs from Campeche Bay to Yucatan Channel.

Although it might appear that the deep ecosystem of the Gulf in this area is quite uniform, in truth there are some remarkable biotal differences. In fact, the biotal differences justify referring to the Western Gulf as the "true" Gulf and the Eastern Gulf as a divergence of the Atlantic Ocean via the Caribbean Sea.

A recent discovery in the deep Gulf shows interesting parallels with the Pacific vent communities discovered some years ago, except at ambient water temperatures. The location given below is in the Vernon Basin leasing area (NG 16-6) Block 945 (Visual No. 2). The following is from Paull et al. (1984a); see also Paull et al. (1984b):

> Exotic communities with abundant organisms were discovered at 3,266 meters depth in the abyssal Gulf of Mexico in March 1984. The communities were found serendipitously at 26 degrees, 2 minutes North, 84 degrees, 55 minutes West, during a diving expedition with the submersible Alvin.
>
> This Gulf community contains the same types of organisms that characterize the Pacific vent communities-white bacterial mats; large, dense beds of mussels; numerous small gastropods; the shells of live mussels; thick patches of 1-meter-long tube worms; red-fleshed vesicomyid clams; galatheid crabs; and eel-like zoarcid fish.
>
> The Pacific vent communities are found immediately adjacent to hydrothermal vents associated with mid-ocean ridge crest magma sources. Until the Florida discovery, these were the only known large deep-sea biological communities that receive their primary energy from chemical sources rather than from the sun through photosynthesis. The chemical energy is released by bacterially mediated oxidation of reduced inorganic compounds, such as hydrogen sulfide, coming from the hot vents. However, the Florida escarpment is not associated with hot water or magmatic sources, but these seep communities appear to thrive on the same kind of energy generation and have similar food chains as do the Pacific communities. Biological production presumably starts with bacterial oxidation of reduced compounds carried in fluids that seep out of the adjacent Florida platform.
>
> The deep-sea communities in the Gulf of Mexico exist on a passive continental margin at ambient temperature. The geological setting is entirely different than that inhabited by the Pacific vent communities. The deep-sea Gulf of Mexico communities are found at the base of the Florida Escarpment, a gigantic limestone cliff that rises some 2,000 meters above the 3,280 meter deep floor of the Gulf of Mexico. The escarpment is composed of outcropping limestones deposited in shallow water 100 million years ago that have since subsided to their present great depths. The community of organisms occurs

> directly at the contact between the abyssal sediments and the limestone wall, where hypersaline waters are seeping out onto the seafloor.
>
> This discovery extends the known range of chemosynthetically supported deep-sea communities into the Atlantic (Gulf), and demonstrates that these communities occur 1) in geologic settings other than mid-ocean ridge crests, and 2) without a heat dependence. This suggests that the most important component necessary to sustain these deep-sea communities is a source of reduced inorganic compounds. The occurrence of such a community on a passive margin suggests hitherto unrealized implications for the origin and maintenance of deep-sea chemosynthetically supported communities.

As mentioned above, the upper 60 m is the euphotic zone, receiving sufficient sunlight to generate photosynthesis among phytoplankters and fixed plants. Beneath the euphotic zone, and extending to within a meter or so of the bottom, is a huge mass of water which beyond the shelf is largely devoid of sunlight. This is the aphotic zone where photosynthesis cannot occur and where the processes of food consumption, biological decomposition, and nutrient regeneration take place in the cold and dark waters. The lowermost layer is the bottom itself together with the contiguous water a meter or so in thickness. This is the benthic zone, repository of sediments from above, where nutrient storage and regeneration take place in association with the solid and semi-solid substrate. Each of these zones has much in common with the others, but each is sufficiently distinct to merit individual separation and analysis. It is a marvel of the ocean that a surface layer of water whose thickness is only about 2% of the average depth of the world's oceans can support the huge biomass living in the largest mass of water on earth, as well as in the largest expanse of soil on the globe. The basis for this is a phenomenon of the geometry of small size; the combined surface area of phytoplankters far exceeds the area of the marine environment. This facilitates the rates of internal reactions and effective use of the sunlight that penetrates the sea surface. Marine plants as large as trees could not produce food as efficiently, a fact that is reflected by the limited development and minor productivity of the giant kelps (Pequegnat, 1983).

The production of particulate organic carbon by plankton in the Gulf appears to average about 55 g C/m^2/yr. The highest values are found in the upwelling area north of the Yucatan Channel and in the region around DeSoto Canyon. In the oceanic region the Western Gulf is more productive than the Eastern Gulf. It is generally assumed that except for brief periods during major plankton blooms, the zooplankton consume all the phytoplankton produced. In turn they excrete a high percentage of their food intake as nutrient-rich feces that sink to the bottom. Most of the herbivorous zooplankters are copepods with calanoids leading all others. A high percentage of the herbivore production is consumed by euphausiids, ctenophores, and chaetognaths within the zooplankton, and most of the remainder is taken up by pelagic fishes. Thus, much of the organic material transported to the bottom from this source takes the form of feces.

The transport of the infauna from the shelf break and upper slope into much deeper zones continues to take place in the Gulf of Mexico. The tracers that have been used to demonstrate the occurrence of this phenomenon are the shells of paleotaxodont bivalves. Three regions where we obtained definite evidence of slumping have been observed in and below DeSoto Canyon, west of the Mississippi Delta, and off Brownsville, Texas.

Another phenomenon that undoubtedly assists in supporting parts of the benthic fauna is the active foraging upon midwater pelagic life carried out by some demersal fishes. Actually, it is not known what the depth limitations of this mode of feeding are, but for the rattail *Coryphaenoides armatus* it appears to be no deeper than the 2,000-m isobath.

It turns out that a surprisingly large number of animals are supported by the complex system described above. The most important megafaunal groups are echinoderms, crustaceans, and demersal fishes. The most important infaunal groups are the polychaete worms and the bivalve molluscs.

One hundred eighty-seven species of echinoderms were collected from the deep Gulf of Mexico extending from the shelf break to the abyss. Asteroids accounted for about one-third of the total, followed by ophiuroids, holothurians, echinoids, and crinoids. Approximately half of the echinoderm species (51%) extended their bathymetric range below the 1,000 m isobath, but as one might expect it is the sea cucumbers that predominate in the deep Gulf. Some 73% of the holothurian species occur below 1,000 m (Pequegnat, 1983).

One hundred ninety-two species of benthic crustaceans were collected in the offshelf waters of the Gulf. Although brachyuran crabs yielded the most species, they are for the most part confined to the shelf and upper slope. In fact, the median depth for the 46 species collected is only 300 m. The number of individuals of brachyurans also show highest levels in the shallower depths. Two other diverse groups are the caridean shrimps with 33 species and the galatheid anomurans with 30 species. Approximately one-third (35%) of the crustacean species extend their bathymetry range below the 1,000 m isobath. Among these it is the penaeid natantians, munidopsid galatheids, and polychelids that as groups predominate in the deep Gulf.

A total of 206 demersal fish species within 47 families were collected. Seventy-nine species ranged into waters 1,000 m or more in depth while 59 species had peak populations at 1,000 m or deeper. The Macrouridae was the most speciose family represented by 30 species. The family Gadidae (codfishes) is a dominant group on the upper continental slope between the shelf break and about 500 m. As expected, the cods were restricted to the upper slope; no species occurred below 800 m. All codfishes have pelagic eggs and larvae. Ophidiids (cusk eels and brotulas) ranged from the shelf to the deepest part of the Gulf of Mexico. The distribution of ophidiid species with depth is fairly uniform. A gradual replacement of species along the depth gradient seems to be the trend.

The infauna were dominated by polychaete worms and bivalves. One hundred thirty-seven species of polychaete worms were collected from the shelf break to the abyss in the northern Gulf of Mexico. These species were distributed among 11 orders and 28 families of which the Maldanidae, Ampharetidae, Sigalionidae, Onuphidae, Eunicidae, and Polyodontidae were the most speciose. It is interesting to note that the leading four families belong to different orders.

A total of 73 species among 18 families of bivalve molluscs were collected. Two glass scallops species (Propeamussium) were the two most abundant bivalves collected. The Propeamussium species apparently form aggregations. Glass scallops are carnivorous and probably feed while swimming by sucking water and small crustaceans and other small prey into the mantle (Pequegnat, 1983).

Central Gulf of Mexico

In the region of the shelf break, the Central Gulf is characterized by a series of "topographic highs" which are geologic features rising out of 100-200 m to various depths and trending east-west along the break. Many of these are the surface expressions of salt domes; nearly all are hard, rocky outcrops; many are drowned coral reefs. The hard, more or less vertical surfaces provide habitat and food for a wide variety of organisms. It has been found, largely through BLM/MMS-funded studies, that at similar depths all these banks contain similar biological communities. The East and West Flower Garden Banks off Texas and Louisiana rise closer to the water's surface than the others and are the only two which contain living coral reefs. For complete descriptions of these biologically important areas, see Bright and Pequegnat (1974), Bright and Rezak (1976, 1978a, 1978b, and 1981), Texas A&M Research Foundation (1982 and 1983), and Bright et al. (1984). Texas A&M Research Foundation (1983) is a synthesis of the 11 years of studies on the Banks of the Gulf OCS performed for DOI.

Because of their particular sensitivity, the interest shown in them, and the fact that at similar depths the other banks show similar biologic zonation, the Flower Garden Banks are often used to describe the biological communities of the topographic highs of the Gulf of Mexico.

There are 16 banks (topographic highs) in the Central Gulf which are considered biologically sensitive because they exhibit the same or similar biological communities as the Flower Gardens at similar depths. None of these banks, however, contain coral reefs, probably because none of them reach as close to the surface as do the Flower Gardens. These are high value biological resources which could be adversely impacted by oil and gas operations and which are currently protected from such potential impacts by stipulations in the applicable lease documents (Section II.A.1.c.(1)). These banks are listed below and can be seen on Visual No. 11.

Sackett Bank
Diaphus Bank
Ewing Bank
Jakkula Bank
Sweet Bank
Fishnet Bank
Alderdice Bank
Parker Bank
Rezak Bank
Sidner Bank
Bouma Bank
Sonnier Bank
18 Fathom Bank
Bright Bank
28 Fathom Bank
29 Fathom Bank

Both 28 Fathom Bank and 29 Fathom Bank are on the line dividing the Central from the Western Gulf and therefore are considered in both.

It should be noted that the emphasis on these biologically sensitive areas is not meant to imply that the rest of the Gulf bottom is devoid of important biological resources. The shrimp fishery alone, which is concentrated over shallow, soft bottom areas (Section III.B.5.), demonstrates the importance of the general Gulf bottom. Defenbaugh (1976) and Rogers (1977) document this importance. However, the soft bottom areas are large, and the biota thereof are adapted to the fine sediments, turbidity, and disturbances. The hard bottom areas are small (in aggregate comprising only about 21,263 acres, or approximately 0.055% of the Central Gulf sale area), generally free of turbidity, contain coarser sediments, and are more sensitive to the types of perturbations likely to be caused by oil and gas operations (i.e., turbidity due to drilling fluids, mechanical damage due to the placement of platforms and pipelines, and smothering by drill cuttings). Thus, the main concern regarding potential damage is for the hard bottom communities.

Western Gulf of Mexico

Conditions in the Western Gulf are quite similar to that of the Central Gulf described above--topographic highs containing biologically important communities which could potentially be harmed by oil and gas operations. These banks are discussed in Bright and Rezak (1976, 1978a, 1978b, and 1981), Texas A&M Research Foundation (1982 and 1983), and Bright et al. (1984). Texas A&M Research Foundation (1983) is a synthesis of the 11 years of studies on the banks of the Gulf OCS performed for DOI. The East and West Flower Garden Banks are located in the Western Gulf sale area. The Flower Gardens were nominated for inclusion in the National Marine Sanctuary Program, and have been placed on the list of Active Candidates (Section I.B.6.). This means that an EIS and a Management Plan will be developed in order to provide for further consideration for inclusion of the Banks in the marine sanctuary program.

In addition to the generally clear water banks rising out of deepwater described above, the OCS off south Texas harbors a different type of bank. From Freeport south, where the break turns to the south, deep and clearwater features are not found; rather, a series of low relief banks rising only 10-20 m in 60-80 m water depth are located farther up the shelf. Compared to the banks of the Central Gulf, these banks have depauperate flora and fauna (Bright and Rezak, 1978a). More sediments are found on the banks and the water is generally more turbid than that found at the Central Gulf banks. These banks, while important biologically, are not nearly as rich and diverse as those of the Central Gulf (Bright and Rezak, 1976 and 1978a).

There are a total of 23 banks in the Western Gulf which are considered biologically sensitive. None of these banks except the Flower Gardens, however, contain coral reefs, probably because none reach as close to the surface as do the Flower Gardens. These are high value biological resources which could be adversely impacted by oil and gas operations and which are currently protected from such potential impacts by stipulations in the applicable lease documents. These banks are listed below and are depicted on Visual No. 11.

Mysterious Bank[1,2]
Blackfish Ridge[1,2]
Dream Bank[1]
Southern Bank[1]
Hospital Bank[1]
North Hospital Bank[1]
Aransas Bank[1]
South Baker Bank[1]
Baker Bank[1]
Big Dunn Bar[1,2]
Small Dunn Bar[1,2]
32 Fathom Bank
Stetson Bank
Claypile Bank[2]
Applebaum Bank
Coffee Lump[2]
West Flower Garden Bank
East Flower Garden Bank
MacNeil Bank
Geyer Bank
Elvers Bank
28 Fathom Bank
29 Fathom Bank

[1] South Texas Banks
[2] Low Relief Banks

Both 28 Fathom Bank and 29 Fathom Bank are on the line dividing the Central from the Western Gulf, and therefore are considered in both.

It should be noted that the emphasis on these biologically sensitive areas is not meant to imply that the rest of the Gulf bottom is devoid of important biological resources. The shrimp fishery alone, which is concentrated over shallow, soft bottom areas (Section III.B.5.), demonstrates the importance of the general Gulf bottom. Defenbaugh (1976) and Rogers (1977) document this importance. However, the soft bottom areas are large, and the biota thereof are adapted to the fine sediments, turbidity, and disturbances that result from shrimp trawling. The hard bottom areas are small (in aggregate comprising only about 50,195 acres, or approximately .087% of the Western Gulf sale area), generally free of turbidity, contain coarser sediments, and are more sensitive to the types of perturbations likely to be caused by oil and gas operations (i.e., turbidity due to drilling fluids, mechanical damage due to the placement of platform and pipelines, and smothering by drill cuttings). Thus, the main concern regarding potential damage is for the hard bottom communities.

3. Endangered and Threatened Species

Five Federally listed endangered whale species occur in the Gulf of Mexico. These include the fin, humpback, right, sei, and sperm whales. Usually, these large cetaceans inhabit the continental slope and deep oceanic waters; occasionally, they are sighted nearshore (Schmidly, 1981). Sperm whales have been sighted near the Louisiana Delta and offshore Brownsville, Texas (Fritts et al., 1983).

Red wolf hybrids occur along the Gulf coast in Cameron Parish, Louisiana and Jefferson County, Texas; for all practical purposes, pure-blood red wolves are extinct in the wild (McCarley and Carley, 1979).

Four Federally listed endangered turtle species (Kemp's ridley, green, hawksbill, and leatherback turtles) and one threatened species (loggerhead turtle) occur in the Gulf of Mexico. The green turtle is listed as endangered in Florida waters and threatened throughout the rest of the Gulf of Mexico. The Kemp's ridley turtle inhabits shallow coastal and estuarine waters. Ridley turtles commonly occur in shallow water areas from Marsh Island to the Mississippi Delta in Louisiana (Hildebrand, 1982). Kemp's ridley turtles infrequently nest on the beaches of southwestern Padre Island, Texas, where FWS, NMFS, and NPS have established a ridley turtle head start release program. The green turtle is found throughout the Gulf where its favored habitats are lagoons and shoals providing an abundance of marine grass and algae on which it feeds. No recent green turtle nesting has been reported along Gulf beaches. Juvenile green turtles occur in Texas estuaries (Hildebrand, 1982) and along the southwest Florida coast. The hawksbill turtle inhabits reefs, shallow coastal areas, and passes in water less than 20 m deep. Hawksbill nesting has been reported along the Gulf coast of Florida. The leatherback turtle is the most pelagic marine turtle and may be found near the continental shelf edge. Sightings have been reported along the Gulf coast in March and April; no recent nesting has been reported along the Gulf coast. The loggerhead turtle occurs throughout the Gulf and has been observed as far as 500 miles out in the open sea. They nest on various barrier islands and beaches from the Florida Keys, up the southwest Florida coast where the majority of nesting in the Gulf occurs (Harris et al., 1984), and west to the Chandeleur Islands off Louisiana where infrequent nesting occurs. Visual No. 3 indicates the general locations of marine turtle nesting.

The American alligator occurs generally throughout the Gulf coast region in fresh to brackish water areas. The alligator is listed as endangered throughout its range except in the coastal areas of Texas where it is listed as threatened and in Louisiana where it is listed as "threatened by similarity of appearance."

The red-cockaded woodpecker occurs primarily in mature open pine forests throughout the Central Gulf area and into eastern Texas.

Arctic peregrine falcons migrate along the eastern coast of Florida, the Florida Keys, and the Gulf coast of Texas. Some peregrine falcons overwinter along the Gulf coastal areas.

The largest population of brown pelicans (about 9,000-10,000 birds) in the Gulf region occurs along the west coast of Florida. A small population of brown pelicans nest on Gaillard Island in Mobile Bay near Theodore, Alabama. Three small brown pelican rookeries (about 2,500 birds) occur at North Island, northern St. Bernard Parish, and Queen Bess Island in Louisiana. Also, a small population of brown pelicans occur near Corpus Christi, Texas, and a small number of brown pelicans from Mexico feed along the southwestern coast of Texas during the summer. The habitat of these colonial nesters are small coastal inlands in salt and brackish water areas as indicated on Visual No. 3.

Bald eagles inhabit several Gulf coastal counties; the majority of this population occurs in Florida. A small population of nonmigratory Mississippi sandhill cranes inhabits an area in Jackson County, Mississippi. Small discrete populations of Attwater's prairie chicken occur in the coastal prairie of the mid Texas coast. A small population (about 70-80) of migratory whooping cranes overwinters at the Aransas National Wildlife Refuge and surrounding wetland areas from October through April.

No Federally listed endangered plant species are known to occur in the Gulf coastal area.

Additional information on endangered and threatened species is found in the FWS and NMFS biological opinions in Appendix C and on Visual No. 3. These proposed lease sales do not represent a substantive modification of the proposal considered in the previous consultations on the potential effects of OCS leasing and exploration on endangered and threatened species in this region, and no significant new information has become available which would alter the conclusions reached in the previous biological opinions.

4. Other Wildlife Species

Other wildlife species which could be impacted by OCS oil and gas activities are discussed below and includes marine mammals and coastal and marine birds. FWS has produced a "Gulf Coast Ecological Inventory" and a set of 22 (1:250,000 scale) maps which are excellent sources of information pertaining to wildlife species along the Gulf coast (Beccasio et al., 1982).

About 27 species of marine mammals have been reported to occur in or migrate through the Gulf region (Schmidly, 1981). Those which occur in coastal waters are primarily the West Indian manatee, small cetaceans (porpoises and dolphins), and occasionally large cetaceans (whales). The whales were discussed in Section III.B.3. All marine mammals are protected under the Marine Mammal Protection Act of 1972 (Section I.B.4.f.).

The bottlenose dolphin is the most common small cetacean which occur in bays, inland waterways, ship channels, and nearshore waters in the northern Gulf of Mexico. Apparently, there are two groups of bottlenose dolphins--small discrete populations that inhabit coastal areas and offshore populations that congregate in large groups. Surveys of the Louisiana-Mississippi coastal waters reported about 2,000-6,000 bottlenose dolphins (Leatherwood and Platter, 1975). Aerial surveys offshore Marsh Island, Louisiana, indicate about 1 dolphin/1.4 mi^2 (1 dolphin/3.7 km^2) (Fritts et al., 1983). Surveys offshore Texas reported about 1,000-5,000 dolphins (Orr, 1977). Aerial surveys indicate about 1 dolphin/1.9 mi^2 (0.203 dolphins/4.9 km^2) offshore Brownsville, Texas (Fritts et al., 1983). Dolphins usually occur in herds of 3-7 animals, but large herds of 200-600 dolphins have been observed. Spotted, striped, and spinner dolphins are other small cetaceans which occur in the Gulf continental shelf waters. Short-finned pilot and pygmy sperm whales occur in the deeper Gulf slope and oceanic waters.

The beaches and coastal wetlands of the northern Gulf of Mexico region are inhabited by several migrant and nonmigrant coastal bird species consisting primarily of three general groups: shorebirds, wading birds, and waterfowl. Feeding and nesting areas include beaches, coastal bays, and other coastal wetland areas. Reproductive activity for these groups occurs from February through August (Portnoy, 1977 and Clapp et al., 1982). Portnoy (1977) recorded 847,000 birds of 26 species in habitats ranging from swamp forest to coastal marshes and barrier islands in the Central Gulf area; the most abundant species were Louisiana heron, snowy egret, and cattle egret.

The northern Gulf of Mexico coastal wetlands are the overwintering site for about 4-7 million migratory waterfowl (Bellrose, 1976). The peak of the fall migration is November-December and spring migration occurs from March to early May. The major waterfowl habitats are coastal bays and wetland areas. The national wildlife refuges and state wildlife management areas provide important feeding, nesting, and resting areas for many of these migratory waterfowl. Recreational hunting of waterfowl along the Gulf coast is an important source of recreation and income. During the 1977-1978 waterfowl season 676,000 hunter-days were recorded for the Louisiana coastal areas.

Marine birds, such as gulls, terns, boobies, petrels, and shearwaters, occur in the Gulf continental shelf region (Murphy, 1967 and Clapp et al., 1982). Marine birds primarily feed and roost offshore, coming ashore for nesting or when storms blow them inshore. Generally, the largest concentrations of marine birds are found near upwelling areas (near the continental slope edge) and other areas of high productivity. Aerial surveys offshore Marsh Island, Louisiana, found 25 species of marine birds and 96% of all marine birds sighted were gull and tern species; surveys offshore Brownsville, Texas, found 24 species of marine birds and 91% of all marine birds sighted were gull and tern species (Fritts et al., 1983).

5. Commercial Fisheries

In the Gulf of Mexico, the shrimp fishery is the most economically important, while the Gulf menhaden fishery constitutes the largest fishery in terms of pounds landed. Approximately 50 species of food fish are harvested in the Gulf. For a more detailed description of commercial fisheries in the Gulf of Mexico, see Volume 1, Section III.B.5. of the Final Regional EIS and Visual No. 4-I.

Central Gulf of Mexico

Alabama's dominant commercial catches are the shellfish (shrimp, crab, and oysters), while commercially important finfish include sea trout, spot, Altantic croaker, striped mullet, and southern flounder. Mississippi produces large quantities of shellfish and finfish with shrimp representing the most important catch. Oysters and blue crabs also contribute significantly to Mississippi's shellfish landings. The Gulf menhaden is the principal species of economic value in Mississippi finfish catches, while commercial landings of foodfishes include croaker, snapper, and flounder. In Louisiana, shrimp (primarily brown and white) constitute the most economically important fishery, while menhaden are the basis of the state's largest fishery. Oyster and blue crab fisheries are the state's third and fourth most valuable fisheries, respectively. Other finfishes which contribute significantly to Louisiana's landings include drum, mullet, sea trout, mackerel, and snapper.

Western Gulf of Mexico

Shrimp, oysters, blue crabs, and finfish constitute the principal fisheries in Texas, with shrimp being by far the most important; economically important finfishes include red drum, spotted seatrout, black drum, menhaden, flounder, and striped mullet. For a more detailed description of commercial fisheries n the Gulf of Mexico, see Volume 1, Section III.B.5. of the Final Regional EIS and Visual No. 4-I.

C. SOCIOECONOMIC CONDITIONS

The socioeconomic impact area comprises 49 counties and parishes. The coastal counties/parishes extend from Baldwin County in Alabama to Cameron County in southernmost Texas. Inland counties/parishes are included where offshore oil and gas support activities are known to exist (such as Lafayette, Louisiana); where offshore-related petroleum industries are established (such as the Mississippi River region in Louisiana); and to account for all counties within Standard Metropolitan Statistical Areas (SMSA) boundaries when one county is on the coast. The counties/parishes in this socioeconomic impact area are:

Central Gulf of Mexico
Alabama - Baldwin, Mobile
Mississippi - Hancock, Harrison, Jackson, Stone
Louisiana - Ascension, Calcasieu, Cameron, East Baton Rouge, Iberia, Jefferson, Lafayette, Lafourche, Livingston, Orleans, Plaquemines, St. Bernard, St. Charles, St. James, St. John the Baptist, St. Mary, St. Tammany, Terrebonne, Vermilion, West Baton Rouge

Western Gulf of Mexico
Texas - Aransas, Brazoria, Calhoun, Cameron, Chambers, Fort Bend, Galveston, Hardin, Harris, Jackson, Jefferson, Kenedy, Kleberg, Liberty, Matagorda, Montgomery, Nueces, Orange, Refugio, San Patricio, Victoria, Waller, Willacy

The Gulf region varies substantially in socioeconomic patterns ranging from low-density, undeveloped rural areas to high-density, highly developed urban centers. There are 13 SMSA's in the region (in east to west order):

Central Gulf of Mexico
Alabama - Mobile
Mississippi - Pascagoula-Moss Point, Biloxi-Gulfport
Louisiana - New Orleans, Baton Rouge, Lafayette, Lake Charles

Western Gulf of Mexico
Texas - Beaumont-Port Arthur-Orange, Galveston-Texas City, Houston, Victoria, Corpus Christi, Brownsville-Harlingen-San Benito

The most populated SMSA's across the two zones in the region are New Orleans and Houston. The least populated are Pascagoula-Moss Point and Victoria.

The highest levels of employment by major industry group in each state's coastal region are in the areas of manufacturing, wholesale/retail trade, and services (including finance, insurance, and real estate (F.I.R.E.)). A summary of specific employment, income, and population characteristics is given below.

1. Employment

Table III-4 reflects the historic indicators for the labor force and unemployment in the Gulf region. In 1970, the regional unemployment rate was just below that of the United States; in 1980, the regional rate was well below the comparable United States figure; in 1984, the regional rate was slightly above the United States rate.

Table III-4

Labor Force Data
Gulf of Mexico Region*

	Labor Force (Thousands)			Unemployment Rate		
	1970	1980	1984**	1970	1980	1984**
Florida	1,076.4	1,929.7	2,291.3	3.7%	5.8%	6.6%
Alabama	133.8	183.1	199.6	5.3%	7.5%	13.3%
Mississippi	78.9	108.1	123.7	4.3%	7.7%	12.9%
Louisiana	742.6	1,081.3	1,096.6	4.9%	5.9%	9.9%
Texas	1,235.3	2,032.7	2,251.0	3.5%	5.0%	8.4%
Gulf Region	3,267.0	5,334.9	5,962.2	4.0%	5.6%	8.2%
United States	82,700.0	106,821.0	113,272.1	4.4%	7.1%	7.6%

*Data shown for each state are for those counties/parishes in the socioeconomic impact area.
**Figures for 1984 are averages of monthly data reported for the January through August period.

Sources: Alabama Dept. of Industrial Relations, 1984.
Florida Dept. of Labor and Employment Security, 1980.
Florida Dept. of Labor and Employment Security, 1984.
Labor Force Estimates for Texas Counties, 1980.
Labor Force Estimates for Texas Counties, 1984.
Labor Market Bulletin, 1980.
Labor Market Bulletin, 1984.
Labor Market Trends, 1980.
Labor Market Trends, 1984.
USDC, Bureau of the Census, 1978.
USDC, Bureau of Economic Analysis, 1983.
USDC, Bureau of Economic Analysis, 1984.

Central Gulf of Mexico

Labor force data for the three central states is given in Table III-4. In both 1970 and 1980, all three states' coastal areas had unemployment rates above the regional average. In 1970, the Louisiana and Alabama coastal regions and unemployment rates above the United States rate; while in 1980, the Mississippi and Alabama regions were above the United States rate. In 1984, the unemployment rates for all three states' coastal zone were above both the rates for the Gulf region and the United States.

The change in labor force over the 1980-1984 period represents a compound annual growth rate of 0.4% for Louisiana, 3.7% for Mississippi, and 2.4% for Alabama.

Employment by major industry group for Alabama is shown in Table III-5. In 1982, the highest levels were recorded in the sectors of trade, services, and manufacturing in order of magnitude for the coastal region. Mobile County accounts for over 85% of all employment in the Mobile SMSA. Between 1970 and 1982, wholesale and retail trade has increased in relative share of the labor force.

Table III-5 also provides employment by major industry group in the Mississippi coastal region. In order of magnitude, the leading sectors in 1982 were manufacturing, trade, and services. Manufacturing was centered primarily in Jackson County (Pascagoula-Moss Point SMSA), while trade and services were concentrated in Harrison County (Biloxi-Gulfport SMSA).

Employment by major industry group for the Louisiana coastal region is also shown in Table III-5. Leading sectors, in order of magnitude, were services, trade, and manufacturing. Manufacturing was far lower in relative share of the labor market in Louisiana than any other state in the Gulf region. Employment in the leading sectors was concentrated in Orleans and Jefferson Parishes of the New Orleans SMSA, East Baton Rouge of the Baton Rouge SMSA, and to a lesser extent in Lafayette Parish of the Lafayette SMSA.

Western Gulf of Mexico

Labor force data for the Texas coastal area is shown in Table III-4. In both 1970 and 1980, the unemployment rate for this coastal zone was below that of the aggregate Gulf region and United States rates. In 1984, it was above the Gulf and the United States rates. The change in labor force over the 1980-1984 period represents a 2.8% compound annual growth rate.

Table III-6 gives the breakdown of employment by major industry groups. Leading sectors, in order of magnitude, were trade, services, and manufacturing. Since 1970, wholesale and retail trade has increased in relative share of the labor force. In 1982, this employment was highly concentrated in Harris County (Houston SMSA) and to a lesser extent in Jefferson and Nueces Counties (Beaumont-Port Arthur-Orange, Corpus Christi SMSA's respectively).

2. Income

Total and per capita personal income for the Gulf region are shown in Table III-7. The per capita personal income for the region was 90% of the United States level in 1970. In 1978, the Gulf region and United States figures were equal. In 1982, per capita personal income for the Gulf region was slightly above the United States level.

Central Gulf of Mexico

Alabama and Mississippi historically have poor personal income indicators. In 1970, the per capita income of these states was 85% and 95% of the Gulf region value and 85% and 90% of the national level, respectively. In 1978, Alabama's per capita income had risen above that of Mississippi's, yet both states had dropped to 80% and 77% of both the Gulf region and United States per capita income levels, respectively. The per capita income of each of these states in 1982 was 75% of the Gulf region figure and 77% of the United States figure. In the same year, average payroll per employee in the coastal region was $13,900 for Alabama and $11,837 for Mississippi. Mississippi achieved the highest percent change in per capita income in the central zone over the 1978-1982 period. Louisiana experienced the highest per capita income level in the Central Gulf in 1982. The per capita income was approximately 104% of the United States level in 1982. Average payroll per employee in Louisiana's coastal zone was $16,572 in 1982.

Western Gulf of Mexico

Texas' Gulf region achieved the largest per capita personal income in the coastal region. In 1982, the Texas coastal zone per capita income level was approximately 10% above that of the Gulf region. In 1970, 1978, and 1982, the Texas coastal region equalled or surpassed the United States per capita income level. Average payroll per employee was $18,536 for the Texas coastal zone in 1982.

Table III-5

Employment by Major Industry Group*
Central Gulf of Mexico - 1982 Percent of Total

	Alabama		Mississippi		Louisiana	
	Coastal Area	Statewide	Coastal Area	Statewide	Coastal Area	Statewide
Agriculture, Forestry, Fishing	0.7	0.4	0.3	0.6	0.3	0.4
Mining	1.1	1.6	4.1	1.5	10.4	8.5
Contract Construction	7.9	6.1	11.5	5.8	9.5	9.0
Manufacturing	22.4	30.9	28.5	33.0	13.5	15.7
Transportation, Communications, Utilities	8.7	6.3	5.1	5.6	10.1	9.0
Wholesale, Retail Trade	28.5	24.6	21.8	26.0	26.9	27.9
Services, including F.I.R.E.	28.7	24.2	20.3	23.1	27.2	27.1
Government	1.9	6.0	8.4	4.6	2.0	2.4

*Totals of industry percentages may not equal 100 due to rounding.

Source: USDC, Bureau of the Census, 1984.

Table III-6

Employment by Major Industry Group*
Western Gulf of Mexico - Texas Coastal Area

	1982 Percent of Total	
	Coastal Area	Statewide
Agriculture, Forestry, Fishing	0.5	0.4
Mining	8.2	5.4
Contract Construction	10.8	8.4
Manufacturing	18.8	20.2
Transportation, Communications, Utilities	7.2	6.5
Wholesale, Retail Trade	25.9	28.5
Services, including F.I.R.E	27.0	27.5
Government	1.5	3.0

*Totals of industry percentages may not equal 100 due to rounding.

Source: USDC, Bureau of the Census, 1984.

Table III-7

Income Data
Gulf of Mexico Region

	Per Capita Personal Income (thousands $)				Total Personal Income (billions $)			
Area	1970	1978	1982	% Change 1978-1982	1970	1978	1982	% Change 1978-1982
Florida	3.5	7.6	10.9	43.4%	12.1	32.3	56.0	73.4%
Alabama	3.0	6.3	8.6	36.5%	1.1	2.8	4.1	46.4%
Mississippi	3.2	6.1	8.6	41.0%	0.8	1.8	2.8	55.6%
Louisiana	3.3	7.5	11.5	53.3%	7.0	17.5	29.8	70.3%
Texas	3.9	8.7	12.6	44.8%	12.0	33.5	60.0	79.1%
Gulf Region	3.5	7.9	11.5	45.6%	33.0	87.9	152.7	73.7%
United States	3.9	7.9	11.1	40.5%	801.0	1,717.0	2,571.5	49.8%

Sources: USDC, Bureau of Economic Analysis, 1977; 1980.
USDC, Bureau of Economic Analysis, 1984.

3. Population

Table III-8 shows population changes in the Gulf region for 1970, 1980, and 1982, when growth over this period was substantial. All states experienced growth rates well above the national level.

Central Gulf of Mexico

Alabama showed substantially larger growth during the 1970-1982 period, while Mississippi and Louisiana underwent a lower percent change in population in the 1970-1981 period than previously experienced in recent years (1960-1970 population data are presented in the Final Regional EIS). However, in all cases, these states' percent change was well above the national growth for the same periods. All of the coastal population in Mississippi and Alabama is located within SMSA boundaries, while for Louisiana this figure is about 80%.

Table III-9 gives the net migration data for the 1970-1978 period. The net migration indicates the change in population as a result of movement into or out of an area (i.e., excluding births and deaths). The net migration for these three states is far below that of Florida and Texas. The three central states account for only 9.3% of the total net migration in the Gulf region.

Western Gulf of Mexico

The Texas coastal zone experienced the highest population change over the 1970-1982 period. The net migration rate for the 1970-1978 period was approximately half that of Florida and was approximately 30% of the total net migration into the Gulf region. SMSA population accounted for about 95% of the Texas coastal zone in 1982.

4. Coastal Management Programs

The Central and Western Gulf of Mexico regions are made up of five coastal states. Three of the four states have Federally approved coastal management programs (CMP). The three states are Alabama, Mississippi, and Louisiana. The fourth state, Texas, conducts coastal management affairs independent of the Federally sponsored coastal zone management planning program.

Regional planning units, made up of a number of cities and counties/parishes, exist in each state. These planning organizations generally conform to state CMP policies and expand these policies into plans and implementation recommendations. A state by state description of CMP policies and a listing of the regional planning units in each state follows:

Central Gulf of Mexico

Alabama Coastal Area Management Program

The Alabama Coastal Area Act (ACAA) of 1976, as amended in 1982 by the Alabama Environmental Management Act (AEMA), divides implementation of coastal resource management between two State agencies: the Department of Environmental Management (DEM) and the Department of Economic and Community Affairs (DECA). The ACAA and the AEMA provides statutory authority to DEM to review all uses which have a direct and significant effect on the coastal area and require a state permit. DEM's permitting authority must be consistent with approved state policies, rules, and regulations. All coastal area program planning policy formulation, coordination, and resource research and study are performed by DECA. Both permitting and planning functions were formerly conducted by the Coastal Area Board until legislative amendments dissolved the Board and reassigned responsibilities in 1982.

Table III-8

Population Data
Gulf of Mexico Region
(000)

Area	1970	1980	1982*	% Change 1970-1982	Compound Annual Growth Rate 1970-1982
Florida	3,423.3	4,809.1	5,153.2	50.5%	3.5%
Alabama	376.7	443.5	457.8	21.5%	1.6%
Mississippi	248.0	309.9	325.5	31.2%	2.3%
Louisiana	2,141.9	2,477.9	2,590.9	21.0%	1.6%
Texas	3,104.4	4,286.5	4,740.3	52.7%	3.6%
Gulf Region	9,294.3	12,326.9	13,267.7	42.8%	3.0%
United States	203,312.0	226,504.8	231,668.2	13.9%	1.1%

*Derived from total personal income and per capita income data.

Sources: Environmental Consultants, Inc. 1974.
USDC, Bureau of the Census, 1982.
USDC, Bureau of Economic Analysis, 1984.

Table III-9

Net Migration Data
Gulf of Mexico Region

Net Migration 1970-1978*

Area	Number (Thousands)	Rate**	Migration as a Percent of the Gulf Region
Florida	791.3	23.1%	61.4%
Alabama	26.5	7.0%	2.0%
Mississippi	15.3	6.2%	1.2%
Louisiana	78.9	3.7%	6.1%
Texas	377.6	12.2%	29.3%
Gulf Region	1,289.6	13.9%	100.0%

* This is the latest year for which data are available.
** Rate is expressed as a percent of the 1970 total population (from previous table).

Source: USDC, Bureau of the Census, 1980.

State Policies

The Alabama Coastal Area Act of 1976 states the following purpose: ". . . to promote, improve and safeguard the lands and waters located in the coastal areas of this State through a comprehensive and cooperative program designed to preserve, enhance, and develop such valuable resources for the present and future well-being and general welfare of the citizens of this State." Statutory policies supporting coastal zone management are detailed in Section III.C.5. of Final EIS 94/98/102.

To provide guidelines for implementation of its enforcement authorities, the state has issued enforceable policies and operational rules. Basically, there are two types of policies: (a) policies for coastal resources uses and (b) policies for natural resource protection. In addition, operational rules, regulations, and action items which further elaborate on these policies have been adopted.

Coastal resource use policies deal with coastal development, mineral resources exploration and extraction, commercial fishing, hazard management, shoreline erosion, recreation, and transportation. Natural resource protection policies deal with biological productivity, water quality, water resources, air quality, wetlands and submerged grassbeds, beach and dune protection, wildlife habitat protection, endangered species, and cultural resources protection.

Special management areas may be delineated under authority of the ACAMP. There are two types of special management areas: geographic areas of particular concern (GAPC) and areas for preservation and restoration (APR). Designated GAPC's are the Port of Mobile and the Mobile-Tensaw River Delta. APR's are Point aux Pins Wetlands System and the National Audubon Society Wildlife Sanctuary.

The South Alabama Regional Planning Commission serves local governments in the coastal area in an advisory capacity. It has no direct management role in coastal zone matters.

Mississippi Coastal Program

The Mississippi Coastal Program (MCP) is administered by the Mississippi Commission on Wildlife Conservation through the Bureau of Marine Resources (BMR). The primary coastal management statute is the Coastal Wildlife Protection Law (Mississippi Code, Section 49-27-1). The authorities of certain other agencies are incorporated into the MCP pursuant to the Mississippi Code (Section 57-16-6) which requires the coastal program to incorporate "all Mississippi." BMR, the Bureau of Pollution Control, the Bureau of Land and Water Resources, and the Department of Archives and History are identified collectively as the "coastal program agencies." The Mississippi Commission on Wildlife Conservation, acting through BMR, consolidates authorities previously assigned to the Marine Resources Council and the Marine Conservation Commission, including authority to study and develop plans, proposals, reports, and recommendations for the development and utilization of the coastal and offshore lands, waters, and marine resources of the state. Additional statutory authorities supporting MCP are listed in Table III-11 of Final EIS 94/98/102.

The scope of the Mississippi Coastal Program is built around 10 stated goals. The goals are described in Table III-12 of Final EIS 94/98/102 along with the State agency having lead responsibility in meeting the goal. As stated in MCP, these goals are intended to promote decisions that balance development with the environment.

State Policies

Mandatory and enforceable policies of MCP are established primarily through direct State agency authorities for the management of coastal wetlands, management of coastal fisheries, air and water pollution control, management of surface and groundwater resources, and protection of cultural resources. Each of these elements of MCP is based on provisions of the Mississippi Code, which require applications for state permits and compliance with adopted State Regulations.

Policies of the state associated with MCP, as stated in Mississippi Codes, are detailed in Section III.C.5. of Final EIS 94/98/102.

The program also provides for the designation of Special Management Areas (SMA's) and the adoption of management plans for such areas. SMA designation does not create new regulatory authority, but does commit the general regulatory provisions of the program to the implementation of SMA plans.

The MCP identifies certain "affirmative management activities." Energy facilities are recognized as likely developments in coastal areas and the MCP provides for State assistance "to local governments to plan and build facilities required as a result of energy developments." Shoreline erosion is identified as a matter of special concern to be addressed primarily through wetlands permitting. Marine fisheries research, identification of areas for "preservation and restoration" through wetlands use planning, improved coordination and processing of required coastal area permits, preservation of natural scenic qualities, and public education are other objectives addressed through MCP policies and regulations.

Two regional organizations are at work in the coastal region of the state. They are the Southern Mississippi Planning and Development District and the Gulf Regional Planning Commission. In addition, MCP activity is conducted with city and county government, local industrial development districts, and various substate agencies, cities, and counties.

Louisiana Coastal Resources Program

The basis for the Louisiana Coastal Resources Program (LCRP) is Act 361, the State and Local Coastal Resources Management Act of 1978 (La. R.S. 49:213.1). The Act puts into effect a set of state coastal policies and coastal use guidelines that apply to coastal land and water use decisionmaking. A number of existing state regulations are also incorporated into the program, including those concerned with oil and gas and other mineral operations; leasing of state lands for mineral operations and other purposes; waterbottom pipelines; hazardous waste and radioactive materials; management of wildlife, fish, other aquatic life, and oyster beds; endangered species; LOOP; and air and water quality.

The Act also authorized establishment of SMA's. Included or planned to be included as SMA's are: LOOP, Marsh Island, artificial barrier islands to protect deteriorating coastal areas, and freshwater and sediment diversion projects to offset land loss and saltwater encroachment.

The coastal use guidelines are based on seven general policies outlined in Act 361. They are implemented through coastal use permits and in-lieu permits. In-lieu permits provide for the use of permit requirements existing before the Act took effect to fulfill the role of coastal use permits, thereby avoiding duplicative permitting procedures.

Act 361 identified a number of uses of state concern subject to coastal use permitting requirements. Uses of state concern listed in Act 361 which could be relevant to a sale and its possible direct effects and associated and nonassociated facilities are: (a) any dredge and fill activity which intersects more than one water body; (b) projects involving the use of state-owned lands or water bottoms; (c) national interest projects; (d) pipelines; and (e) energy facility siting and development.

State Policies

The Legislature declared the public policy of the state to be described by seven policy statements detailed in Section III.C.5. of Final EIS 94/98/102. The implementation of these policies was provided for by the state legislature in Section 213.8 of the Act 361. This section allows for the promulgation of coastal use guidelines. The coastal use guidelines are the criteria for granting or denying coastal use permits.

Existing state regulatory provisions incorporated into the LCRP include those which address: (a) oil, gas, and mineral operations; (b) state lands management; (c) transportation, storage, and disposal of hazardous waste; (d) use and disposal of radioactive materials; (e) management of wildlife, fish, and other aquatic life; (f) management of oyster bedding grounds; (g) water quality; (h) resident endangered or threatened species; (i) construction and operation of offshore terminal facilities; (j) construction, operation, and abandonment of water wells; and (k) air quality. Where appropriate and applicable, requirements under these existing state regulatory measures have been incorporated into the various coastal use guidelines identified above. A careful examination of the LCRP indicates that aside from the coastal use guidelines, existing State water and air quality provisions (La. R.S. 30:1068, 1081-1087, 1091-1096, 38:216) are applicable to the possible direct effects and associated or nonassociated facilities connected with oil and gas activities.

Four Regional Planning Councils (RPC) are involved with the coastal area of Louisiana. The RPC's act in an advisory capacity to local units of government, State agencies, and local groups. The RPC's are listed in Section III.C.5. of Final EIS 94/98/102.

Western Gulf of Mexico

Texas Coastal Management Program

In May 1981, the State of Texas formally withdrew from the Federally sponsored coastal zone management program. In place of a coastal zone management plan with certain mandated features of the Coastal Zone Management Act of 1972, Texas has a network of 14 State agencies involved in the regulation of coastal resources. This network is held together by a memorandum of understanding (MOU) between State agencies. The MOU exists to accomplish the following:

(a) improve coordination between State agencies;

(b) require State agencies to collect data and conduct impact assessments in order to approve, deny, or conditionally approve proposed projects; and

(c) to encourage State agencies to participate on a voluntary basis so as to avoid a duplication of effort, overlaps, and conflicts between agencies.

The Texas state coastal zone management program is decentralized. The General Land Office of Texas, operating under authority vested in an elected commissioner by the Texas Coastal Public Land Management Act of 1973, coordinates the permitting system conducted by the state. The General Land Office reviews and recommends actions to be taken based on permit applications received from the U.S. Army Corps of Engineers and Texas State agencies with statutory permitting authority. The program area of jurisdiction is public land/waters under tidal effect including bays, rivers, and the Gulf of Mexico out to the three league line. Most of the activities reviewed have to do with oil and gas development, dredging, and spoil areas.

State Policies

Since no formal coastal zone management program (in the context of CZMA) exists in Texas, no formal policies associated with a program may be cited. Policies and permitting procedures have been established to implement coastal resources management on an agency by agency basis, and a voluntary coordination mechanism is in operation by the General Land Office of Texas.

Five regional planning units are operating in the Texas coastal area. These Councils of Government (COG) provide technical assistance to their member cities and states. In the face of limited regulatory powers, COG's have a limited impact on coastal resource management.

5. Oil and Gas Industry

The infrastructure for oil and gas production in the Gulf of Mexico is the most developed in the world. It includes oil refineries, petrochemical and gas processing plants, supply bases for offshore services, platform construction yards, pipeline yards, and other industry-related installations. This infrastructure is highly concentrated in the coastal areas of Louisiana and eastern Texas and to a lesser extent along the southern half of the Texas Gulf coast. To the east, the infrastructure is found as far as Mobile, Alabama. Visual No. 7 provides a graphic display of the extent and concentration of this Gulf region infrastructure.

During the 1980-1983 period, the oil and gas industry expanded its capacity rapidly. Subsequent reductions in demand compounded the problems of significant overbuilding. Severe financial problems resulted for many owners and builders of work boats, drilling rigs, and related businesses. These economic difficulties have had serious repercussions throughout the coastal region.

The prospects for economic recovery in the Gulf of Mexico are greater than industry-wide projections, however, primarily because of recent leasing activity in this Region. Between May 1983 (when Gulfwide leasing began) and August 1984, the number of blocks leased in effect in the GOM increased by about 64%. The primary impact on the oil and gas industry has been a partial restoration of the coastal economy, as offshore drilling and field development activity generate demand for underutilized facilities. Mobile rig utilization rates, which serve as one indicator of available facilities, have increased in the Gulf, from 73% working in March 1983 (prior to Gulfwide leasing) to 84% working in October 1984. Utilization rates are expected to increase to a level that will sustain economic recovery without creating unmanageable "boom" conditions.

The production of crude oil and gas may be classified as a primary industry while the further processing of oil and gas in refineries, natural gas plants, and petrochemical plants may be considered as secondary industries. Existing facilities appear adequate to accommodate significant growth in both primary and secondary industries within the region.

OCS oil and gas production, particularly in Louisiana, has been a major source of employment and revenues in the study area since 1954. Approximately 130,000 jobs are directly or indirectly dependent on the offshore program. Approximately 110,000 of these jobs are associated with activity offshore from Louisiana, and 20,000 are related to offshore Texas. Estimates of direct employment offshore in 1983 were as follows: 50,000 workers in the Central Gulf and 9,000 workers in the Western Gulf. The average annual payroll associated with oil and gas activities amounts to approximately $2.9 billion for the Gulf coast region ($2.4 billion for Louisiana and $.5 billion for Texas). Average annual tax dollars generated per employee in the offshore oil and gas program are estimated at 8% of payroll revenues. The total amount of state and local taxes generated annually by the Federal offshore oil and gas program is estimated at $193.1 million from the Central Gulf and $39.5 million from the Western Gulf.

The annual production value of oil and condensate has continuously increased since 1954, although the quantity of such production has steadily declined since 1972. Annual gas production within the study area has increased steadily since 1954. In 1982, the value of oil produced in the Gulf of Mexico Federal offshore area was $9.5 billion ($8.9 billion from Louisiana and $.6 billion from Texas), and the value of gas produced in the area was $12.4 billion ($10.1 billion from Louisiana and $2.3 billion from Texas). The cumulative value of oil and gas production through 1982 was $95.2 billion in the Central Gulf and $8.3 billion in the Western Gulf.

Selected Standard Industrial Classification (SIC) codes serve to further identify the extent of employment in the oil and gas industry. These are:

13 - oil and gas extraction
29 - petroleum and coal products
3533 - oil field machinery
46 - petroleum pipelines
492 - gas production distribution
517 - petroleum and petroleum products

SIC 13 is considered the primary industry while the others indicate secondary industries. Other SIC codes include some OCS-related secondary industries within broader categories of data that are excluded from this analysis (particularly SIC 3731, which includes shipbuilding and

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mobile rig fabrication). Tertiary (induced) industries are not included. Table III-10 gives the approximate levels of employment and payroll data for these selected SIC codes in the Gulf region (onshore and offshore combined) for 1982. Note the substantial level of employment in the secondary industries in the Texas coastal zone. The data are reported by establishments according to place of work, although the data include a portion of the County Business Patterns data reported as "statewide" to account for offshore employment and payroll. Employment in SIC 13 is reported for all counties in Texas except three (Cameron, Kenedy, and Willacy) and for all parishes in Louisiana except two (St. Tammany and West Baton Rouge). For Alabama, SIC 13 data are reported for only one county (Mobile), and for Mississippi, no SIC 13 data are reported for any county.

Table III-10

Employment and Payroll Data[1]
Selected Oil and Gas SIC Codes
Gulf of Mexico Region (1982)

Area	SIC 13		Aggregate SIC's 29, 3533, 46, 492, 517	
	No. Employees	Payroll per Employee	No. Employees	Payroll per Employee
Florida	256	$13,092	4,597	$17,325
Alabama	422	$17,550	1,603	$19,672
Mississippi	None	None	1,892	$10,078
Louisiana	71,860	$25,468	21,588	$20,683
Texas	58,689	$28,983	99,564	$25,390
TOTAL	99,991	-[2]	129,244	-[2]

[1] When a range for the employment data was given, the mid-point was used. Payroll estimates were made using only data disclosed for both employment and payrolls. For Louisiana and Texas, SIC 13 data include a portion of the County Business Patterns data reported as "statewide" to account for offshore employment and payroll. For Alabama, Florida, and Mississippi, however, none of the data reported as "statewide" have been included due to lack of information on which to base apportionment.

[2] Not applicable.

Source: USDC, Bureau of the Census, 1984.

6. Ports and Marine Transportation

Ports serving waterborne commerce along the Gulf coast include some of the busiest in the Nation. Table III-11 provides a breakdown of the dollar value and poundage of exports and imports shipped to and from the four Customs Districts in the CPA and WPA in 1983. The New Orleans district ranked first in the dollar value of exports in the Gulf and in the entire Nation. The Houston/Galveston district ranked first in value of imports in the Gulf and third nationally.

In addition to the major ports, there are numerous smaller ports involved in waterborne commerce. Table III-12 contains an aggregation by planning and analysis area of the commodity short tonnage transported by vessel through the harbors and waterways providing access to selected ports along the Central and Western Gulf coast in 1982. The majority of this activity, 62%, occurred in the CPA, while the WPA accounted for 38%.

Table III-11

Import-Export Data (from vessels)
Gulf of Mexico Region (1983)

Area (U.S. Customs District)*	Exports			Imports		
	Million $	Million Lbs.	Rank ($)	Million $	Million Lbs.	Rank ($)
Mobile	1,399.0	13,559.7	6	2,053.9	21,208.9	5
New Orleans	18,137.6	193,362.6	1	13,784.0	117,314.1	2
Port Arthur	1,539.5	20,430.0	5	4,251.0	39,192.5	3
Houston/Galveston	13,220.2	68,018.8	2	19,506.1	133,330.7	1
United States	100,829.7	723,910.0		155,921.7	753,731.3	

*Ports of Entry in each U.S. Customs District include: Mobile District-Gulfport, Pascagoula, Mobile, Pensacola, Panama City, Port St. Joe, Apalachicola, Carrabelle; New Orleans District-New Orleans, Baton Rouge, Morgan City; Port Arthur District-Port Arthur, Beaumont, Orange, Lake Charles; Houston/Galveston District-Houston, Galveston, Freeport, Port Lavaca-Point Comfort, Corpus Christi.

Source: USDC, Bureau of the Census. 1983.

Many of the ports in the CPA and WPA are involved in activities associated with the exploration, development, and production of oil and gas in the Gulf. Some of the areas have developed into important centers for offshore support. The most active of these are, from east to west, Venice, Morgan City, Intracoastal City, and Cameron in Louisiana and Sabine Pass, Port O'Connor, and the Ingleside-Aransas Pass-Port Aransas area in Texas. The locations of these and other ports involved in the offshore industry are shown on Visual No. 7.

A heavily used shipping pattern has developed in the Gulf. Ships crossing open Gulf waters often utilize a system of established safety fairways as shown on Visual No. 11 and previously discussed in Section I.B.4.a. of this document. These fairways connect the major Gulf ports including the deepwater oil terminal LOOP which is located offshore Louisiana (Section I.B.6.b.). Regulations prohibit the placement of fixed structures in fairways, thus providing clear passages of 2 nmi in width through the developed areas of the Gulf. Vessels operating along the coast generally use the Gulf Intracoastal Waterway (GIWW) which follows the coastline inshore and through bays and estuaries from Fort Myers, Florida, to Brownsville, Texas.

Table III-12 also indicates the number of vessel trips to and from ports in the CPA and WPA made by vessels with drafts greater than 18 ft and those with drafts less than or equal to 18 ft. Vessels with drafts greater than 18 ft are generally ocean-going bulk cargo ships and oil tankers, which have the most potential for conflict with OCS oil and gas activities and structures. Many of the shallower draft vessels, especially barges, use the GIWW.

The vessel trips to and from the port of Mobile may increase significatnly in the future with the 1985 opening of the Tennessee-Tombigbee Waterway. The new waterway will connect the navigable Tennessee River to the Tombigbee-Black Warrior River systems, thereby linking the Port of Mobile with 16,000 miles of waterways in 23 states. Traffic levels to and from the Mississippi River and its ports may also be affected by shifts in traffic patterns resulting from the new transportation corridor.

7. Military Use/Warning Areas

Central Gulf of Mexico

Ten percent, or 4,078,000 acres, of water and air space of the Central Gulf is used for the various military operations within three warning areas and water test areas. Warning Area 453 is

Table III-12

1982 Central and Western Gulf of Mexico Freight and Vessel Traffic

Port/ Harbor/Waterway	Freight Traffic (short tons)	Vessel Traffic to and from Port/Harbor/Waterway		
		Draft Greater Than 18'	Draft Less Than or Equal to 18'	Total Trips
Central Gulf				
Subarea C-1				
Calcasieu River and Pass	18,876,295	5,846	26,968	32,814
Mermentau River	1,095,382	-	4,312	4,312
Freshwater Bayou	361,146		4,008	4,008
C-1 Total	20,332,823	5,846	35,288	41,134
Subarea C-2				
Atchafalaya River	2,294,692	-	21,751	21,751
Houma Navigation Canal	1,215,283	-	13,119	13,119
Bayou Lafourche and Lafourche Jump Waterway	766,660	-	21,895	21,895
C-2 Total	4,276,635	-	56,765	56,765
Subarea C-3				
Barataria Bay Waterway	1,160,092	-	12,355	12,355
Empire to Gulf	751,264	-	27,402	27,402
Port of New Orleans (freight only)	177,302,387	-	-	-
Mississippi River Passes (trips Only)	-	15,500	14,471	29,971
Mississippi Gulf Outlet	3,877,861	1,273	17,146	18,419
C-3 Total	183,091,604	16,773	71,374	88,147
Subarea C-4				
Pearl River (LA and MS)	40,171	-	74	74
East Pearl River	28,300	-	216	216
Cadet Bayou	513	-	1,180	1,180
Wolf and Jordan Rivers	38,686	-	53	53
Pass Christian Harbor	28,832	-	9,174	9,174
Gulfport	1,195,912	539	1,669	2,208
Biloxi	1,658,973	-	9,515	9,515
Pascagoula	19,157,414	809	14,319	15,128
Bayou LaBatre	14,379	-	1,932	1,932
Bayou Coden	1,419	-	4,928	4,928
Dauphin Island Bay	2,003	-	15	15
Mobile Harbor	32,320,845	1,761	28,496	30,257
Bon Secour River	9,312	-	1,952	1,952
Perdido Pass	158		5,662	5,662
C-4 Total	54,496,917	3,109	79,185	82,294
CPA Total	262,197,979	25,728	242,612	268,340
Western Gulf				
Subarea W-1				
Brownsville	2,200,132	291	1,424	1,715
Port Isabel	307,856	4	1,800	1,804
Corpus Christi Ship Channel	37,974,192	1,684	13,896	15,580
Matagorda Ship Channel	4,308,436	258	868	1,126
W-1 Total	44,790,616	2,237	17,988	20,225
Subarea W-2				
Freeport Harbor	14,989,683	1,237	4,177	5,414
Galveston Channel	9,349,856	1,460	2,676	4,136
Texas City Channel	33,370,791	1,216	12,382	13,598
Houston Ship Channel	94,649,549	8,486	53,146	61,632
Sabine-Neches Waterway	79,526,671	2,887	56,396	59,283
W-2 Total	231,886,550	15,286	128,777	144,063
WPA Total	276,677,166	17,523	146,765	164,288
CPA And WPA Total	538,875,145	43,751	389,377	432,628

Source: U.S. Dept. of the Army, Corps of Engineers, 1984a.

an Air National Guard training area, Warning Area 92 is a Naval Air Reserve training area, and Warning Area 155 is a Navy training area. In these areas, use is infrequent and intermittent.

An intensive use of W-92 or W-453 or the water test areas has not been indicated by the Navy or Air Force in the past. All three areas have had very little oil and gas development. Warning area 155 is used by the Navy for carrier maneuvers and carrier pilot training. Although W-155 has had very little oil and gas development within it, the Navy has indicated that W-155 has a continuous and intensive use, and that the Navy is concerned that future oil and gas exploration and development facilities may seriously restrict their operations in the area.

Warning Areas	Defense Operations Conducted
W-92	Air-to-air gunnery, rocket firing, sonar buoy operations
W-453	Air National Guard training
W-155	Carrier maneuvers, carrier pilot training
EWTA-1	Rocket and missile testing and research
EWTA-3	Rocket and missile testing and research

Western Gulf of Mexico

Thirty-seven percent, or 12,000,000 acres, of water and air space of the Western Gulf of Mexico is used for the various military operations within two warning areas. Warning area 602 is used extensively from the surface to 45,000 feet for a myriad of training profiles that include live firing aerial gunnery, trailing wire antenna activity, flares and chaff drops/tests, and B-52 G-model low level flights. However, the Air Force has not indicated an intensive use of W-602. Because it lies mostly over deeper waters, Warning Area 602 has had oil and gas development only in the northern one-third of the area. Warning Area 228 has been intensively used by the Navy for carrier maneuvers and carrier pilot training, and has had considerable oil and gas activity take place within it.

Warning Areas	Defense Operations Conducted
W-228	Air-to-air gunnery, rocket firing, aircraft carrier operations, submarine operations
W-602	High altitude training

8. Commercial Fishing Industry

The Gulf of Mexico is a very important fisheries production area with total annual landings averaging over two billion pounds, valued at over $600 million dockside (USDC, NMFS, 1984a). The Gulf shrimp fishery represents the single most valuable fishery with landings (heads removed) averaging approximately 200 million lbs/yr, worth about $300 million. The menhaden purse seine fishery is the most important fishery in terms of pounds landed with landings ranging from about 1,000-1,200 million lbs/yr, worth about $40-$45 million. About 50 species of finfish contribute to the total Gulf food finfish landings that average about 112.5 million lbs/yr, worth about $26.3 million. Oyster landings approximate 15 million lbs/yr, valued at $13 million. About 40 million lbs of blue crabs are landed annually, worth about $5-$6 million.

In 1982, there were about 34,000 fishermen operating 18,900 crafts of various sizes in the Gulf region. In 1981, there were 841 processing and wholesale plants in the area that employed over 13,000 people (USDC, NMFS, 1983). The Gulf region's processed fishery products amount to over $660 million annually and represent about 20% of the comparable United States total. About 65% of the value of processed products is related to shrimp production; menhaden ranks second with 11%. About 70% of all Gulf processing involves frozen packaged items followed by industrial products at 12%, canned items at 11%, and fresh products at 7%.

Tables III-13 and III-14 show the total catch (excluding freshwater species) and total value of the catch (dockside) for some NMFS grid zones and MMS analysis areas, respectively. For a more detailed description of the commercial fishery industry in the Gulf of Mexico, see Volume 1, Section III.C.6. of the Final Regional EIS and Visual No. 4-I. For a depiction of the analysis areas, see Figure IV-1.

9. Recreational Resources

The northern Gulf of Mexico coastal zone is one of the major recreational regions of the United States, particularly in connection with marine fishing and beach-related activities. The shorefronts along the Gulf coasts of Florida, Alabama, Mississippi, Louisiana, and Texas offer a diversity of natural and developed landscapes and seascapes. The coastal beaches, barrier islands, estuarine bays and sounds, river deltas, and tidal marshes are extensively and intensively utilized for recreational activity by residents of the Gulf south and tourists from throughout the Nation, as well as from foreign countries. Publicly-owned and administered areas such as National seashores, parks, beaches, and wildlife lands, as well as specially designated preservation areas such as historic and natural sites and landmarks, wilderness areas, wildlife sanctuaries, and scenic rivers attract visitors throughout the year. Commercial and private recreational facilities and establishments, such as resorts, marinas, amusement parks, and ornamental gardens, also serve as primary interest areas and support services for people who seek enjoyment from the recreational resources associated with the Gulf.

It has been determined in the CPA and WPA that three broad categories of recreational resources/activities are susceptible to direct and potentially significant impacts from OCS leasing and development: (a) recreational fishing; (b) major shorefront recreational beaches; and (c) designated environmental preservation areas. For a detailed definition, description, and discussion of these resource categories and their relative importance within the planning areas, see Volume 1, Section III.C.7. of the Final Regional EIS. Additionally, Visual Nos. 4-II, 10, and 14 provide a synoptic view of the location, extent, and components of the recreational resources potentially affected by the ongoing OCS sales in the Gulf of Mexico. Subsequent to the issuance of the Final Regional EIS, several new OCS office publications ("Proceedings: Third and Fourth Annual Gulf of Mexico Information Transfer Meeting (1982 and 1983)" and "The Ecology of Petroleum Platforms in the Northwestern Gulf of Mexico, A Community Profile" (Gallaway and Lewbel, 1982)), provide additional information on the environmental aspects of the Gulf's recreational fishing affected by OCS leasing and development. "Offshore Fishing--Central Gulf of Mexico" (Ditton and Auyong, 1984) provides a comprehensive analysis of fishing patterns directly associated with petroleum platforms in the Central Gulf of Mexico. A new recreational fishing map (Reggio et al., 1983) published by MMS graphically and narratively provides information on the relationship of offshore recreational fishing and petroleum development in the Delta Region of the Central Gulf of Mexico. The Louisiana State University Sea Grant Program (Roberts and Thompson, 1983) has issued a new publication focused on the socioeconomic effects of scuba diving directly associated with petroleum platforms in the Central Gulf. Additionally, FWS published a comprehensive series of natural resource maps (Gulf Coast Ecological Inventory, scale 1:250,000) that depicts 538 important fish and wildlife species and their habitats along the coastal fringes of the five Gulf coast states. Major land use designations such as parks and refuges in the 138,400 mi^2 region are plotted on the inventory's 22 maps. Published as an adjunct to the maps is a narrative users' guide which provides detailed explanations of the ecological data displayed on each map (Beccasio et al., 1982).

Table III-13

Catch by National Marine Fisheries Service Grid Zone

AVERAGE CATCH 1977-1981
(million pounds and million dollars)

	Total		Inshore	
Grid Zone	Pounds	Dollars	Pounds	Dollars
11	171.6	35.5	150.9	15.9
12	210.8	24.9	208.7	22.6
13	182.7	55.6	17.1	13.1
14	46.8	37.5	16.6	17.4
15	374.4	61.0	11.2	2.6
16	300.9	41.1	4.5	3.0
17	299.1	38.0	0.4	0.1
18	27.8	36.2	8.6	9.5
19	28.5	50.5	16.3	13.1
20	11.9	27.8	3.7	3.4
21	8.3	21.1	1.4	0.7

(See Visual No. 4-I for a depiction of the grid zones.)

Source: Tidwell, 1983.

Table III-14

Catch by MMS Analysis Area*
(million pounds and million dollars)

	Total		Inshore	
Analysis Area	Pounds	Dollars	Pounds	Dollars
Central Gulf of Mexico				
C-4	117.9	22.1	105.1	11.5
C-3	422.3	85.8	270.8	38.6
C-2	378.1	95.5	28.4	21.6
C-1	568.0	77.7	6.9	3.6
Western Gulf of Mexico				
W-2	148.5	80.0	18.6	17.5
W-1	31.4	68.8	11.6	9.3

*Based on Catch by Grid Zone (Table III-13).

A larger scale map (1:100,000) of existing information about the biological, physical, and social sciences, including recreational resources for all Gulf States, has been published by FWS (Garofalo, 1982a) under the Gulf of Mexico coastal characterization program. Map narratives (Garofalo, 1982b), data appendixes, and synthesis reports addressing recreational resources and activities in the coastal and marine areas of all Gulf States have also been published by FWS under this program.

10. Tourism Industry

Central Gulf of Mexico

According to data from the Alabama Bureau of Publicity and Information (1983), tourist-related travel expenditures in Alabama amounted to about $2.9 billion in 1982. Such travel expenditures generated more than 65,000 jobs, with a payroll of about $575 million and contributed about $110 million in state retail sales tax collections, excluding gasoline tax receipts. About 10% of the travelers cited Alabama Gulf coast beaches as their destination.

Data from a study prepared for FWS and BLM (Larson et al., 1980) indicate that tourism along the Mississippi Gulf coast involves about 2.9 million out-of-state visitors annually. In 1983, Gulf region sales at tourist-related establishments such as hotels, motels, and restaurants exceeded $215 million, and state gasoline tax receipts from Gulf region travelers were about $2.7 million, based on information from the University of Southern Mississippi's Bureau of Business Research. Of the four counties that comprise the study region, Harrison County is responsible for about 65% of these sales and tax receipts. The main Gulf coast tourist attractions include the white sand beach along the Pass Christian-Biloxi stretch of the coast and the Gulf Islands National Seashore area. In 1983, the Gulf Islands National Seashore received 850,000 visitors.

Data from the U.S. Travel Data Center (1983) indicate that in the Louisiana Gulf region, travel expenditures amounted to over $2.7 billion in 1982, representing about 85% of comparable statewide expenditures. Over $555.4 million, or 20% of the region's total expenditures, served as payrolls to about 61,000 employees. Also, state and local tax receipts from these travel expenditures equalled $84.0 and $48.7 million, respectively. Over 67% of the study region's travel expenditures occur in Orleans Parish. Unlike tourism in other parts of the Gulf region, very little activity is associated with Gulf beaches; instead, major attractions include a variety of sports events, festivals, conventions, and sightseeing activities.

Western Gulf of Mexico

According to data from the Texas Tourist Development Agency, total travel expenditures in the Texas Gulf region were about $4.6 billion in 1983, or 33% of the comparable state total. These expenditures provided about 95,000 jobs to Texas residents with payrolls of about $998 million. Related state and local tax receipts for the Gulf region in 1983 were over $105 and $61 million, respectively. About 93% of the Texas Gulf region's travel expenditures occurred in major metropolitan areas that are in close proximity to popular Texas Gulf beaches, specifically in Cameron, Galveston, Harris, Jefferson, and Nueces Counties (Visual No. 4-II).

11. Cultural Resources

Cultural resources are any objects or features which are man-made or modified by human activity. Significant cultural resources are either historic or prehistoric and, as defined by 36 CFR 60.6, generally include properties greater than 50 years old which are associated with events that have made a significant contribution to the broad patterns of our history; are associated with the lives of persons significant in the past; embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; possess high artistic values; represent a signficant and distinguishable entity whose components may lack individual distinction; or have yielded, or may be likely to yield, information important in prehistory or history.

The State Historic Preservation Officers for all Gulf coast states were contacted and requested to indicate which sites on the National Register of Historic Places within their coastal zones could potentially be affected by OCS leasing activities. These sites, which include historic buildings, forts, lighthouses, and shipwrecks, are depicted on Visual No. 11.

a. Historic

Although most historic cultural resources on the OCS are shipwrecks, other types of historic sites, such as the Ship Shoal Lighthouse, may occur in Federal waters.

A literature search for reported ship losses and known shipwrecks was conducted as part of the cultural resources baseline study for the northern Gulf of Mexico (CEI, 1977). From the information provided by this literature search, a breakdown of known shipwrecks and reported losses in the Gulf is given in Table III-15 below.

Table III-15

Known Shipwrecks and Reported Losses in the Gulf of Mexico

Historic Period	Number of Wrecks*	Location Known**
1500 to 1699 A.D.	146	0
1700 to 1819 A.D.	275	1
1820 to 1899 A.D.	719	10
Totals: Pre-20th Century	1,140	11
1900 to 1945 A.D.***	398	90
Unknown Date	51	9
Totals: All Periods	1,589	110

* It should be noted that the above numbers are only approximations since many losses of entire fleets are listed as single wrecks and since it cannot be determined whether several wrecks reported by different sources are the same wreck or not.

** Some of the wrecks had such broad locations given (i.e., covering an entire latitude and longitude) that they were not included in the category "location known."

*** Some wrecks from this period include World War II casualties. Although most World War II wrecks may not be considered historically significant at this time, their historic significance in terms of the National Register criteria will have to be addressed within the life of the lease which result from the proposed lease sales.

The figures above indicate that less than 2% of pre-20th century ships reported lost in the Gulf and less than 10% of the ships reported lost between 1500 and 1945 have known locations. Considering the problems with inaccurate wreck reporting, drift and breakup of wrecks, and ships which have been lost but never reported, it becomes apparent that very little is really known about the locations of historic shipwrecks in the Gulf of Mexico.

In order to deal with the management problems of this largely unlocated resource base, a high probability zone for the occurrence of shipwrecks, Zone 1, was proposed by the baseline study (CEI, 1977). This zone was delineated by using geographic factors, such as approaches to seaports, straits, shoals, reefs, and historic shipping routes as indicators of high shipwreck potential.

Once a ship goes down, the spatial distribution of site materials (integrity/preservation of the site) is governed by sea state, water depth, type of bottom, nature of the adjacent coast, strength and direction of storm currents and waves, and the size and type of construction of the vessel.

Required remote sensing surveys on the OCS have recorded evidence of approximately 57 potential wrecks. Ten of these are definite wrecks while the remaining 47 would require further investigation for positive identification. Eighty percent of these possible wrecks were recorded within Zone 1 which, according to the baseline study, is where the highest incidence of shipwrecks should occur.

Central Gulf of Mexico

Based on the information provided by the cultural resources baseline study, supplemented by information from the quarterly Defense Mapping Agency printout of Nonsubmarine Contracts, MMS records show 51 shipwrecks with known locations in the CPA. Table III-16 lists the wrecks by OCS lease block, and also lists the blocks within which, according to the position accuracy evaluation given in the Defense Mapping Agency printout, the wreck could possibly lie (US, DOD, DMA, 1982a).

It should be emphasized that hundreds of other ships from all historic periods are known to have gone down somewhere in the Central Gulf; however, information on the location of these reported wrecks is not sufficient to allow mapping.

According to the baseline study for the northern Gulf, the high probability zone for shipwreck occurrence in the Central Gulf (Zone 1) is very broad, extending to the 80 m contour in some areas (Visual No. 11).

The major factor which would affect the integrity of wreck sites in the Central Gulf would be the unconsolidated Holocene deltaic sediments which comprise the bottom sediments in the eastern portion of the planning area. These sediments would provide protection of site components as they settled. An excellent example is provided by the recently excavated eighteenth century Spanish galleon, the El Nuevo Constante, off Cameron Parish, Louisiana (El Nuevo Constante, 1981). This wreck displayed excellent preservation of organic materials (e.g., leather, bone, and wood) due to the unconsolidated clays which encapsulated the wreck, creating an anaerobic environment. This type of wreck preservation would not be anticipated in the westernmost portion of the CPA where the bottom sediments range from outcrops of subaerially weathered clay to localized transgressive sand deposits.

Western Gulf of Mexico

Based on the information provided by the cultural resources baseline study, supplemented by information from the quarterly Defense Mapping Agency printout of Nonsubmarine Contracts, MMS records show 17 shipwrecks with known locations in the WPA. Table III-17 lists the wrecks by OCS lease block, and also lists the blocks within which, according to the position accuracy evaluation given in the Defense Mapping Agency printout, the wreck could possibly lie (US, DOD, DMA, 1982a).

It should be emphasized that hundreds of other ships from all historic periods are known to have gone down somewhere in the Western Gulf; however, information on the location of these reported wrecks is not sufficient to allow mapping.

According to the baseline study for the northern Gulf, the high probability zone for shipwreck occurrence in the Western Gulf (Zone 1) runs very close to the boundary of Texas territorial waters over much of the western portion of this planning area. This zone, however, is much broader in the eastern portion of the planning area, extending to the 40 m contour in some areas (Visual No. 11).

The major factor which would affect the integrity of wreck sites in the Western Gulf would be the unconsolidated Holocene deltaic sediments which comprise the bottom sediments in the central and western portions of the planning area. These sediments would provide some protection

Table III-16

Shipwrecks With Known Locations in the Central Gulf

Name	Type	Date			Block Number	Other Blocks Within Which Wreck Could Lie
		Built	Sunk	Recorded		
C. Strong	Schooner	1882	1916	1917	Lund 775	
W.H. Marston	Schooner	1901	1927	1928	Lund 344	
J.W. Clise	Schooner	1904	1940	1941	Lund 168	
T.H. Wand	Cargo	1906	1919	1920	Atwater 636	
Nokomis	Schooner	1897	1905	1906	Mississippi Canyon 1008	
Paul Harwood	Tanker		1942		Mississippi Canyon 555	
Alcoa Puritan	Cargo		1942	1950	Mississippi Canyon 428	Mississippi Canyon 384, 385, 429
Robert E. Lee	Cargo	1924	1942		Mississippi Canyon 334	
Anona	Unknown		1944		Viosca Knoll 830	Viosca Knoll 829, 873, 874
Bayard	Passenger/Cargo		1942	1945	Main Pass 140	
Tulsa	Cargo/Schooner	1909	1943	1943	Mobile 1002	
Unknown	Barge		1920	1943	falls within 3 mile limit	
Lewis Brothers	Schooner		1925	1945	falls within 3 mile limit	
Manhorton	Cargo	1938		1945	falls within 3 mile limit	
Magnolia CG	Gunboat		1945		falls within 3 mile limit	
Carrabelle	Tanker	1920	1942	1950	Lund 671	Lund 626-628, 670, 672
Amapala	Cargo		1942	1950	Lund 453	Lund 408, 409, 452, 454, 496, 497
Gulf Oil	Tanker	1912	1942	1942	Mississippi Canyon 795	Mississippi Canyon 750, 751, 794
Heredia	Cargo	1908	1942	1945	Ship Shoal 216	Ship Shoal 217
R.W. Gallagher	Tanker		1942	1945	Ship Shoal 207	
Gulf Prince	Tanker		1942		Ship Shoal 206	
Gulf Penn	Tanker	1921	1942	1942	Mississippi Canyon 499	Mississippi Canyon 455, 456, 500
Aurora	Tanker		1942		Mississippi Canyon 393	
Sun	Tanker		1942		South Timbalier 127, 136	
Halo	Tanker	1920	1942		South Timbalier 131	
U-166	Submarine		1942	1965	Ship Shoal 87 South Timbalier 141	Ship Shoal 164 South Timbalier 112
(Alternate Location)	Submarine		1942	1943	Ship Shoal 116, 139 South Timbalier 74, 75	
Hamlet	Tanker		1942	1945	Eugene Island 237	

Table III-16. Shipwrecks With Known Locations in the Central Gulf (continued)

Name	Type	Date Built	Date Sunk	Date Recorded	Block Number	Other Blocks Within Which Wreck Could Lie
Fairhope	Steamer	1899	1918		South Pass 37, 45	
Louisiana	Cargo	1919	1926	1926	South Pass 31	
B. Brewster	Tanker		1942	1945	South Timbalier 23, 24	Grand Isle 11, 12,16,17
El Vivo	Cargo		1945	1945	Grand Isle 12, 16	
Thistle	Unknown		1877		South Timbalier 18	
City of Toledo	Tanker		1942	1945	Eugene Island 94	Eugene Island 95
Unknown	Unknown			1944	Vermilion 191	South Marsh Island 29
WaWa	Trawler				West Cameron 297	
E.F. Coney	Cargo	1904	1930	1930	East Cameron 64	
Unknown	Unknown			1944	West Cameron 135	
Unknown	Trawler			1943	West Cameron 75	
Leo Huff	Oil Screw	1941	1947	1950	West Cameron 73	
Unknown	Trawler		1943		West Cameron 72	
Dewey	Trawler		1956	1956	falls within 3 mile limit	
Linda	Trawler				falls within 3 mile limit	
El Constante	Galleon		1766	1979	falls within 3 mile limit	
Sheherozada	Tanker		1942	1945	Eugene Island 190, 191	
Unknown	Unknown			1945	Ship Shoal 110	Ship Shoal 121
R.M. Parker, Jr.	Tanker		1942	1945	Ship Shoal 116, 139 South Timbalier 74, 75	
Wm. C. McTarnahan	Tanker		1942		South Timbalier 47, 48, 55, 56	
David McKevy	Tanker	1921	1942	1945	South Timbalier 36	
Paul Warner	Tanker	1921	1942	1942	South Pass 44,45	South Pass 54, 55
Virginia	Tanker	1941	1942	1945	West Delta 109	
Yuma	Cargo		1926	1945	South Pass 43 West Delta 82	

Table III-17

Shipwrecks With Known Locations in the Western Gulf

Name	Type	Date Built	Date Sunk	Date Recorded	Block Number	Other Blocks Within Which Wreck Could Lie
Honduras	Steamer		1911		falls within 3 league limit	None
Gloria Colita	Schooner	1939	1941	1945	falls within 3 league limit	None
Margate	Cargo		1945	1945	falls within 3 league limit	None
Jennie S. Butler	Schooner		1900		falls within 3 league limits	None
Laura R. Burnham	Bark		1883		falls within 3 league limit	None
Patton	Barge	1910	1917		falls within 3 league limit	None
John S. Ames	Schooner		1899		falls within 3 league limit	None
Unknown	Tug		1944	1945	falls within 3 league limit	None
Besco	Unknown				falls within 3 league limit	None
S.C. 1063	Patrol Boat		1943	1943	falls within 3 league limit	None
Galveston	Dredge		1943	1950	falls within 3 league limit	None
ABL 92	Cargo		1943		falls within 3 league limit	None
Torry	Unknown		1878		North Padre Island, East Addition A-86	None
Orion	Cargo	1906	1945	1945	falls within 3 league limit	None
Unknown	Barge			1943	falls within 3 league limit	None
Oaxaca	Passenger/Cargo		1942	1943	falls within 3 league limit	None
U.S.S. Hatteras	Steamship		1863		Galveston 269	None

of site components as they settled. Preservation would probably not be as good in the easternmost portion of the WPA where the bottom sediments range from outcrops of subaerially weathered clay to localized sand deposits.

b. Prehistoric

From the late Wisconsin maximum low sea stand (approximately 18,000 B.P.) until sea level reached its current high stand (approximately 5,000 to 3,000 B.P.), the OCS was subaerially exposed and inhabitable by terrestrial flora and fauna--including prehistoric man, who is known to have been in the Gulf coast region since about 12,000 B.P. According to the sea level curve proposed for the northern Gulf by Coastal Environments, Inc. (CEI, 1982), sea level would have been approximately -45 m at 12,000 B.P. Therefore, the continental shelf shoreward of the 45 m bathymetric contour (probability zones 1 and 2) would have potential for prehistoric sites dating subsequent to 12,000 B.P. Further, since prehistoric sites generally occur in predictable geographic areas, it was proposed in the CEI study that the same areas where sites of a given period occur on land will be the same areas where sites will occur on the now submerged shelf. These geographic areas with a high probability for associated prehistoric sites are listed in Table III-37 of the Final Regional EIS, along with other information on the extent and types of sites to be found in these areas.

Remote sensing surveys which have been required on leases shoreward of the 45 m contour have been very successful in identifying the geographic features with a high probability for associated prehistoric sites listed in Table III-37 of the Final Regional EIS.

Regional geologic mapping studies by MMS provide a geologic framework to aid in the interpretation of lease block survey data. This regional framework allows interpretations to go beyond a statement that a relict feature occurs to an assessment of its archaeological potential in terms of its general age, the type of system to which it belongs, and the geologic processes which formed and modified it.

In addition to identifying areas with a high probability for site occurrence, the potential for site preservation must also be considered as an integral part of the predictive model. In general, it may be expected that sites covered by sediments in a low energy environment (i.e., floodplains, bays, lagoons, river terraces, and subsiding deltas) prior to the sea's transgression of the area will have a high degree of preservation. Other protected areas (i.e., depressions, ponds, lakes, and sinkholes) and areas subjected only to low wave energy would be conducive to site preservation. Sites on relatively steep shelves which were transgressed during periods of rapid rise in sea level may also have better potential for preservation due to the shorter period of time during which sites would have been exposed to shorefront erosion.

Although many specific areas in the Gulf have been identified through lease block surveys as having a high potential for prehistoric sites, these high probability areas have generally been avoided by oil and gas development rathar than investigated.

Central Gulf of Mexico

Of the geographic features listed in Table III-37 of the Final Regional EIS which have a high probability for associated prehistoric sites, all but karst areas are found in the Central Gulf.

The eastern portion of the CPA is characterized by Holocene deltaic deposits of the Mississippi River, ranging from several hundred feet thick to only a thin veneer. Subaerially developed natural levee ridges, delta front barrier islands, bays, and lagoons are abundant in this area. Sites around bays and lagoons would have a high probability for preservation, while natural levee sites may be preserved under the right conditions. Sites associated with relict delta front barrier islands would probably be extensively reworked and incorporated into the relict barrier island sands. The thickness of archaeologically sterile open-shelf Holocene marine sediments in some areas (generally closer to the active Mississippi Delta) may preclude recovery of site information in the underlying strata.

The western portion of the CPA is generally devoid of Holocene sediments, except in the extreme western portion where localized concentrations of transgressive Holocene sands reach thicknesses up to 7 m (USDI, MMS, 1984a). Many large, late Pleistocene fluvial systems are within a few feet of the seafloor in this area; an excellent example is provided by the ancient Sabine-Calcasieu River Trench. This ancient river valley was extensively studied and mapped by Nelson and Bray (1970) using borehole and seismic data. A study funded by MMS to locate prehistoric archaeological sites in association with the buried Sabine-Calcasieu River Trench is currently underway. The Phase I, Task 1, literature search and data synthesis portion of this study tentatively identified five types of relict landforms in association with this buried river trench. These include valley margins/floodplains, terraces, natural levee ridges, point bars, and bay/estuary margins. These landforms were further evaluated for potential cultural deposits through the collection of original seismic data. Based on these data, vibracores were collected to evaluate areas of potential cultural deposits. The final phase of this study will attempt site identification through laboratory analysis of the core material. Lease block surveys from other areas have recorded evidence of numerous relict late Pleistocene fluvial systems ranging from a few hundred feet across with a maximum cut of 5-10 ft, up to several thousand feet across with maximum cuts of over 100 ft. Evidence of floodplains, terracing, and point bar deposits have been recorded in association with many of these fluvial systems. Sites located along floodplains and terraces, and within point bar deposits would be expected to have a higher potential for preservation than those sites located along the unprotected outer valley margins; however, these sites may also be preserved under the right conditions. Several examples of salt domes with bathymetric expression have also been recorded during lease block surveys in this area. Preservation of site materials associated with salt domes would be good within solution depressions and possibly in protected areas of rock outcrops associated with the salt dome. Due to the proximity of most of these relict landforms to the seafloor, the potential for further investigation and data recovery from these sites would be excellent.

Western Gulf of Mexico

Of the geographic features listed in Table III-37 of the Final Regional EIS which have a high probability for associated prehistoric sites, all but karst areas are found in the Western Gulf.

The western portion of the WPA is characterized by Holocene deltaic deposits of the Colorado and Brazos Rivers. According to a geologic map series produced by the MMS Office of Marine Geology at Corpus Christi, Texas, the Holocene sediments west of the 96°W longitude range from approximately 12-143 ft thick (Berryhill and Trippett, 1981). Data from lease block surveys in this area indicate that these Holocene sediments begin thinning east of the 96° longitude. Subaerially developed natural levee ridges, delta front barrier islands, bays, lagoons, and salt domes with bathymetric expression have been recorded as a result of lease block surveys in this area. Sites around bays and lagoons would have a high probability for preservation, while natural levee sites may be preserved under the right conditions. Sites associated with relict delta front barrier islands would probably be extensively reworked and incorporated into the relict barrier island sands. Preservation of site materials associated with salt domes would be good within solution depressions and possibly in protected areas of rock outcrops associated with the salt dome. The thickness of archaeologically sterile open shelf Holocene marine sediments in some areas may preclude recovery of site information in the underlying strata.

The easternmost portion of the WPA is generally devoid of Holocene sediments except in areas of localized transgressive sand deposits. Many large, late Pleistocene fluvial systems are within a few feet of the seafloor in this area; an excellent example is provided by the ancient Sabine-Calcasieu River Trench. This ancient river valley was extensively studied and mapped by Nelson and Bray (1970) using borehole and seismic data. A study funded by MMS to locate prehistoric archaeological sites in association with the buried Sabine-Calcasieu River Trench is currently underway. The Phase I, Task 1, literature search, and data synthesis portion of this study tentatively identified five types of relict landforms in association with this buried river trench. These include valley margins/floodplains, terraces, natural levee ridges, point bars, and bay/estuary margins. These landforms were further evaluated for potential cultural deposits through the collection of original seismic data. Based on these data, vibracores were collected to evaluate areas of potential cultural deposits. The final phase of this study will attempt site identification through laboratory analysis of the core material. Just north of the study area, along the east Texas coast, McFaddin Beach has produced late Pleistocene megafaunal remains and lithics from all cultural periods. Work in this area has not presently allowed a definitive conclusion as to whether the site materials are eroding out of the beach deposits or are being washed onto the beach from offshore. Lease block surveys from other areas have recorded evidence of numerous relict late Pleistocene fluvial systems ranging from a few hundred feet across with a maximum cut of 5-10 ft, up to several thousand feet across with maximum cuts of over 100 ft. Evidence of floodplains, terraces, and point bars have been recorded in association with many of these fluvial systems. Sites located along floodplains and terraces, and within point bar deposits would be expected to have a higher potential for preservation than those sites located along the unprotected outer valley margins; however, these sites may also be preserved under the right conditions. Due to the proximity of most of these relict landforms to the seafloor, the potential for further investigation and data recovery from these sites would be excellent.

As a result of the Phase I, Task 1, literature search and data synthesis portion of the current DOI study discussed under the CPA, possible shell middens were identified along the relict late Wisconsin Trinity/San Jacinto River Trench. These shell deposits may represent actual prehistoric sites rather than relict landforms having a high potential for the occurrence of such sites.

For a complete discussion of historic and prehistoric cultural resources, see Volume 1, Section III.C.9. of the Final Regional EIS. Figure III-2 is a revised version of the sea level curve shown in Figure III-21 of the Final Regional EIS.

12. Water Supply

Water supply problems have arisen as the result of a great influx of population to the Gulf coastal areas. Although much of the Central Gulf experiences little to no water supply problems due to its extensive water resources, many areas in the southern portion of Texas are experiencing drastic shortages of both potable and nonpotable water sources. The existing water supply of the coastal regions of the planning areas is briefly discussed below. For a more detailed discussion of water supply, see Volume 1, Section III.C.10. of the Final Regional EIS.

Central Gulf of Mexico

The Central Gulf abounds in surface and groundwater resources with plentiful supplies of fresh surface water due to the high rainfall rates and upstream runoff into the coastal basins. Rain surplus, coupled with favorable geologic conditions, has enabled extensive groundwater aquifers to develop throughout this region. Although plentiful water supplies abound here, continuous and cyclical groundwater pumpage takes place throughout the Central region, and in the last few decades declining water levels have reversed the direction of the hydraulic gradient in many areas aquifers, resulting in saltwater intrusion. Although there are numerous cases of saltwater intrusion throughout this region, surface water surpluses aid in maintaining the freshwater head necessary in preventing serious saltwater intrusion problems in the Central Gulf.

Western Gulf of Mexico

The coastal segment of Texas depends heavily on its surface and groundwater resources for industrial, municipal, and agricultural uses. Rapid increases in urbanization and industrialization along the coastal area have drastically cut into its water supply. Present withdrawals in the Houston-Galveston area exceed the region's aquifer recharge capacity. Heavy pumpage of coastal aquifers has introduced problems concerning saltwater intrusion and subsidence in many of the coastal counties of the state. The pumpage of large quantities of groundwater in

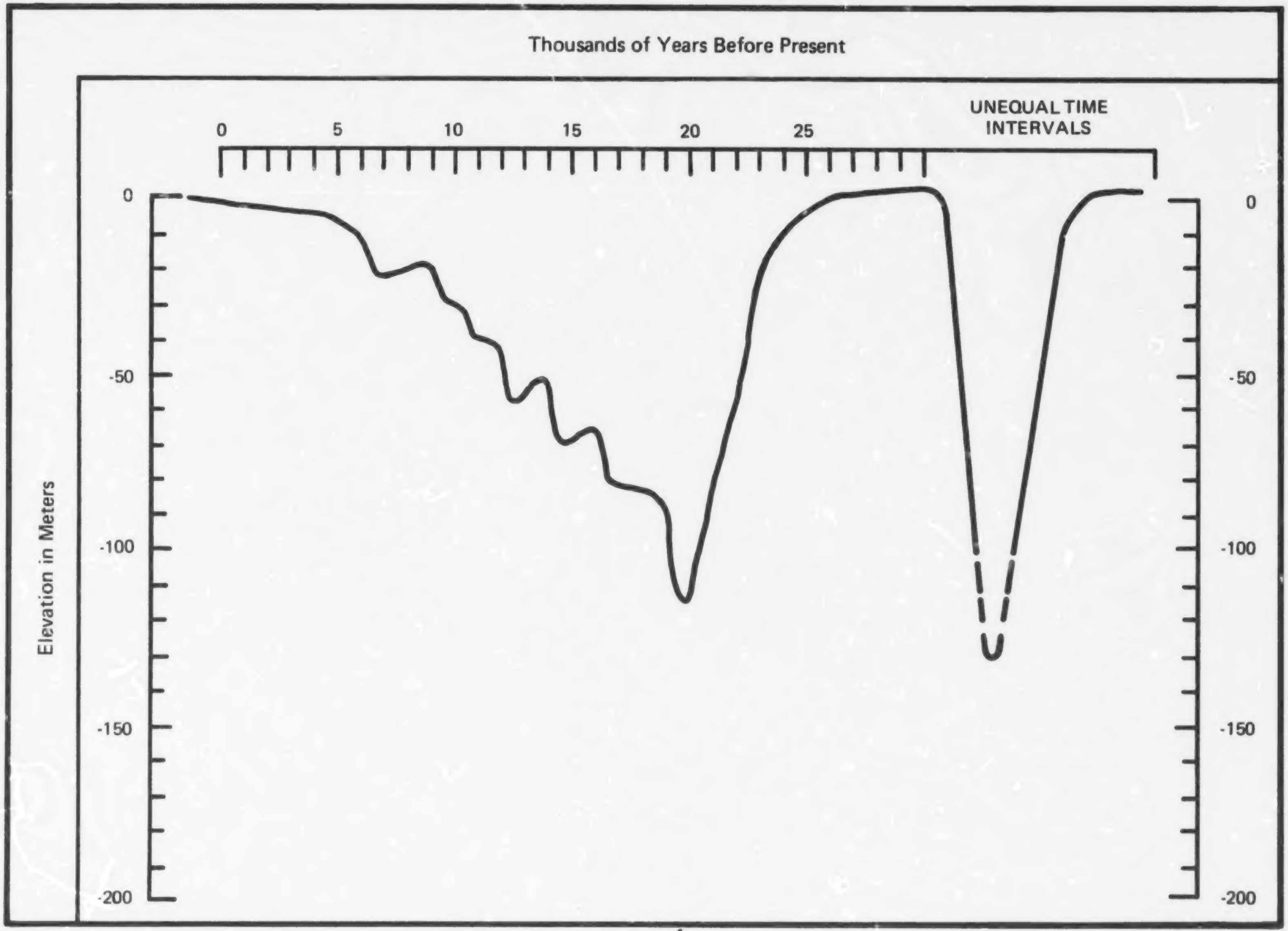

Figure III-2. Curve of Relative Land-Sea Level.

the Houston-Galveston region of Texas has resulted in declines in artesian pressure, further resulting in pronounced regional subsidence of the surrounding land surface. Several reports have described this subsidence as a result of the permanent compaction of fine-grained clay strata in the subsurface caused by loading due to pressure declines associated with the removal of subsurface fluids, primarily water, oil, and gas. As this phenomenon occurs, the overlaying land-surface tends to sink, resulting in lowering area elevations, changing surface gradients, and the activation of faults. The results are changes in drainage patterns, which aggravate flooding problems in the coastal areas and pose an increased risk of catastrophic flooding due to hurricane tidal surges. The greatest water supply problems exist in the lower Rio Grande Valley where the annual rainfall rates are less than 24 inches and surface water rights appear to be 100% appropriated. One of the remedies to the freshwater consumption needs of the Texas coastal zone has been the construction of several reservoir dams throughout the state; however, though these have aided in meeting the vast water consumption needs of the coastal zones, various side effects have added to existing water quality problems in these areas. Reduction of flow into estuarine systems aids in reduction of flushing and lengthens the time that pollutants remain in the bays and estuaries of the region.

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SECTION IV

ENVIRONMENTAL CONSEQUENCES

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IV

IV. ENVIRONMENTAL CONSEQUENCES

A. DEVELOPMENT SCENARIOS

Development scenarios are used in this analysis to provide a quantitative and locational framework for detailed analysis of potential impacts of proposed OCS oil and gas lease sales in the Central and Western Planning Areas of the Gulf of Mexico (Figure IV-1).

A development scenario is a hypothetical framework of assumptions and estimates on the amounts, timing, and general locations for OCS exploration, development, and production activities and facilities, both offshore and onshore. As such it is not a prediction of future oil and gas activities because all of these activities are unpredictable prior to a sale and only become clear as offshore and onshore development proceeds from lease through production. Such factors as the contemporary economic marketplace and available support facilities and pipeline capacities at the time of future infrastructure development are all unknowns. Notwithstanding these inherent difficulties, the scenarios represent best assumptions and estimates on a set of future conditions which are considered reasonably foreseeable and suitable for presale impact analyses.

It is noted that these development scenarios do not represent a MMS recommendation, preference, prediction, or endorsement of any level of leasing or offshore operations, or of the types, numbers, and/or locations of any onshore operations or facilities.

1. Most Likely Find Scenarios (M Scenarios)

The M Scenarios are for use in analyzing the impacts (sale specific) of the proposed actions. These scenarios are based on resource estimates considered reasonably likely to occur as a result of the proposed actions. The resource estimates of oil and gas discovered and produced represent a fraction of the total undiscovered economically recoverable resources (mean conditional estimates) in each planning area. In addition each of the scenarios was formulated on the basis of available data on industry interest in leasing, recent levels of leasing and hydrocarbon discoveries, existing offshore and onshore oil/gas infrastructure, industry practice, and economic considerations. Table II-1 (Central Gulf Sale 104) and Table II-3 (Western Gulf Sale 105) provide a summary of major elements of the M Scenarios and some of the related impact producing factors for each proposed action. Additional information on the oil spill contact assumptions for these scenarios is included in Section IV.A.5.

a. Resource and Offshore Infrastructure Estimates

The proposed action for the CPA (Central Gulf Sale 104) would offer for lease all unleased blocks in the CPA. As of December 1984, there were approximately 33.1 million acres (approximately 6,163 blocks) in the CPA; however, this figure will be reduced due to the net effect of proposed Sale 98 (May 1985) and lease relinquishments.

The proposed action for the WPA (Western Gulf Sale 105) would offer for lease all unleased blocks in the WPA with the exception of Blocks A-398 and A-375 in High Island Area, East Addition, South Extension (West and East Flower Garden Banks, respectively) and 123 blocks adjacent to the United States provisional maritime boundary with the Republic of Mexico, which have been deferred from the proposed action. As of February 1985, there were approximately 28.2 million acres (approximately 5,089 blocks) in the WPA; however, this figure will be reduced due to the net effect of Sale 102 (August 1985) and lease relinquishments.

The oil and gas resource estimates, as well as the total number of exploration and delineation wells, production platforms and wells, and miles of offshore pipeline needed to discover, develop, and produce the estimated amounts of resources are shown in Table IV-1 for each proposed action.

Table IV-1

Resource and Offshore Infrastructure Estimates: Sales 104 and 105

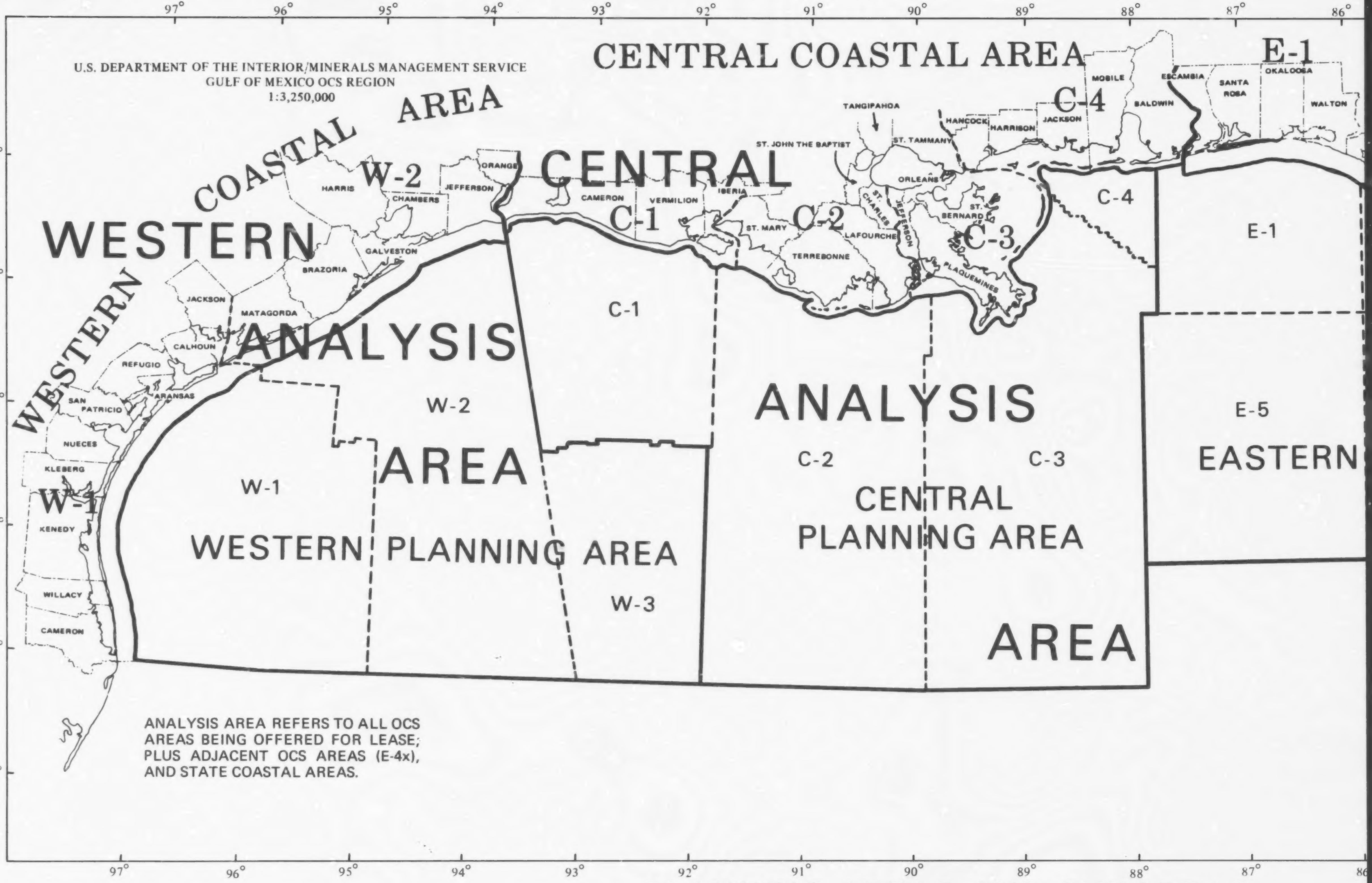
	Central Planning Area - Sale 104			Western Planning Area - Sale 105		
	Scenario			Scenario		
	L	M	H	L	M	H
Acreage Available for Leasing[1] (millions of acres)	33.1	33.1	33.1	28.2	28.2	28.2
Resources Expected to be Developed[2]						
Oil (billion bbls)	0.06	0.15	0.27	0.03	0.10	0.18
Gas (tcf)	0.50	1.23	2.58	0.50	1.34	2.40
Annual Peak Production						
Oil (billion bbls)	0.007	0.018	0.032	0.004	0.012	0.022
Gas (tcf)	0.060	0.148	0.310	0.060	0.161	0.288
Offshore Infrastructure						
Exploration and Delineation Wells	140	360	700	120	320	580
Platforms (Production)	8	20	40	6	20	30
Production Wells	80	200	400	60	170	310
Pipeline (miles)	107	220	320	40	160	260

Note: Tables IV-1 through IV-5 include estimates for the Low Find (L) and High Find (H) Scenarios. These scenarios are described and analyzed in Section IV.D.1.d. (Central Gulf Sale 104) and Section IV.D.2.d. (Western Gulf Sale 105).

[1] Unleased acreage available for leasing (deferred acreage not included) as of December 1984 for Sale 104 and as of February 1985 for Sale 105. The indicated amounts will be modified as a result of the net effect of Sale 98 (CPA) and Sale 102 (WPA) and lease relinquishments.

[2] Estimates of resources expected to be discovered and produced as a result of the proposed actions. The L, M, and H Scenario values are based on the 95th percentile, mean, and 5th percentile conditional estimates, respectively, of the total unleased undiscovered economically recoverable resources in the portion of each planning area being offered under the proposed actions.

Source: USDI, Minerals Management Service, Gulf of Mexico OCS Region estimates.


U.S. DEPARTMENT OF THE INTERIOR/MINERALS MANAGEMENT SERVICE
GULF OF MEXICO OCS REGION
1:3,250,000

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96°
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87°
86°
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27°
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25°
CENTRAL COASTAL AREA
E-1
WESTERN COASTAL AREA
WESTERN ANALYSIS AREA
W-2
W-1
W-3
CENTRAL
C-1
C-2
C-3
C-4
ANALYSIS
AREA
E-5
EASTERN
WESTERN PLANNING AREA
CENTRAL PLANNING AREA
HARRIS
CHAMBERS
JEFFERSON
ORANGE
GALVESTON
BRAZORIA
JACKSON
MATAGORDA
CALHOUN
REFUGIO
ARANSAS
SAN PATRICIO
NUECES
KLEBERG
KENEDY
WILLACY
CAMERON
VERMILION
IBERIA
ST. MARY
TERREBONNE
LAFOURCHE
ST. CHARLES
JEFFERSON
ST. JOHN THE BAPTIST
TANGIPAHOA
ST. TAMMANY
ORLEANS
ST. BERNARD
PLAQUEMINES
HANCOCK
HARRISON
JACKSON
MOBILE
BALDWIN
ESCAMBIA
SANTA ROSA
OKALOOSA
WALTON

ANALYSIS AREA REFERS TO ALL OCS AREAS BEING OFFERED FOR LEASE; PLUS ADJACENT OCS AREAS (E-4x), AND STATE COASTAL AREAS.

PLANNING AREAS AND SUBAREAS

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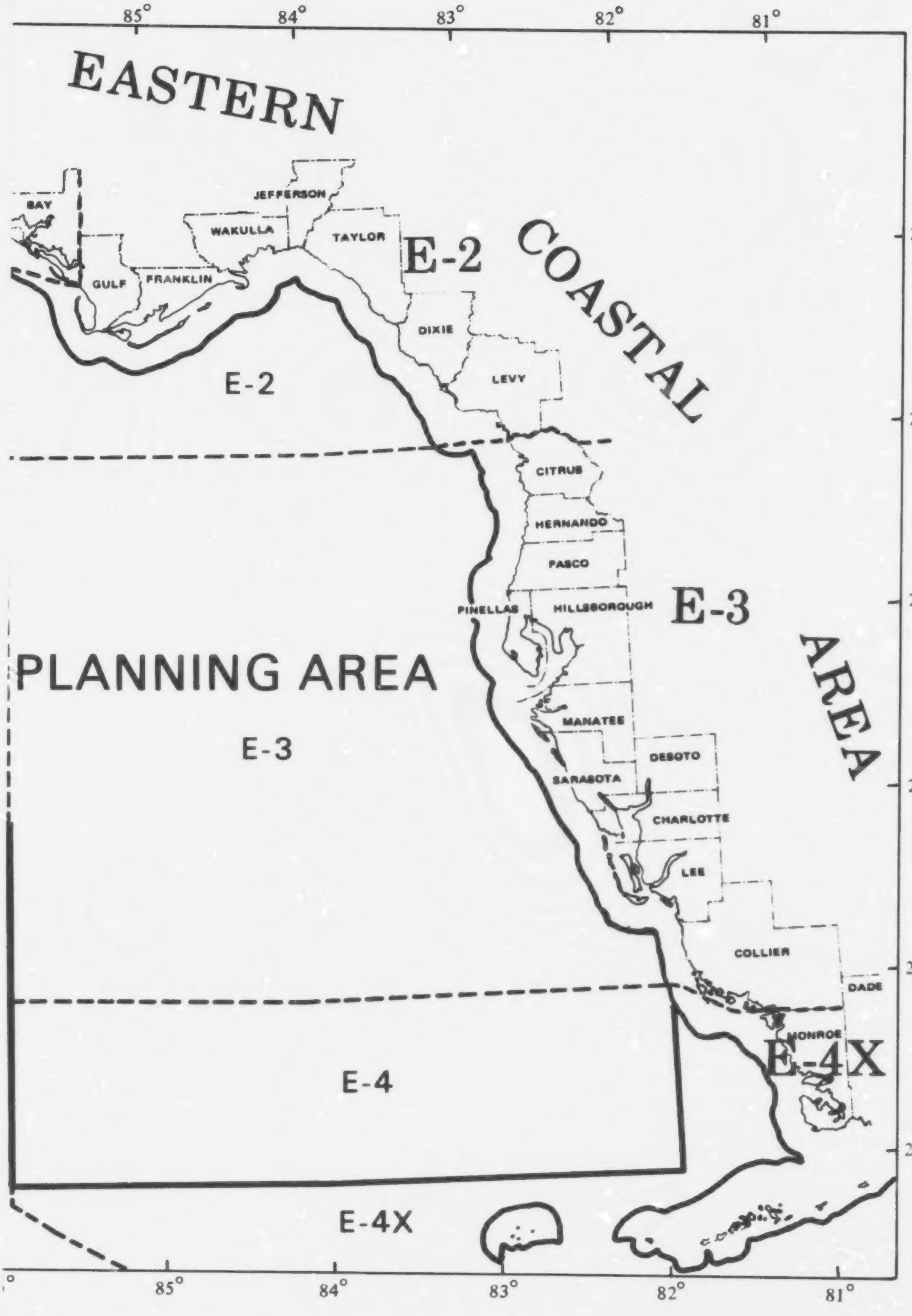
85°
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EASTERN
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JEFFERSON
WAKULLA
TAYLOR
GULF
FRANKLIN
E-2
DIXIE
LEVY
E-2
30°
29°
CITRUS
HERNANDO
PASCO
PINELLAS
HILLSBOROUGH
E-3
28°
PLANNING AREA
MANATEE
DESOTO
SARASOTA
E-3
27°
CHARLOTTE
LEE
COLLIER
26°
DADE
MONROE
E-4X
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E-4X
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82°
81°

Figure IV-1.

120B

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The estimated amounts of oil and gas to be discovered and produced as a result of each sale are based on the mean conditional estimates of the total undiscovered economically recoverable resources in each planning area, recent levels and trends in leasing, and estimates of resource recovery levels associated with recent sales in each planning area. Based on the analysis of these factors, it is estimated that the resources recovered (oil and gas discovered and produced) as a result of Central Gulf Sale 104 will be 0.15 billion barrels of oil and 1.23 trillion cubic feet of gas (representing about 6.4% of the mean conditional estimate of the total unleased undiscovered economically recoverable resources). Similarly, it is estimated that the resources recovered as a result of Western Gulf Sale 105 will be 0.10 billion barrels of oil and 1.34 trillion cubic feet of gas (representing about 6% of the mean conditional estimate of the total unleased undiscovered economically recoverble resources).

New estimates of the total undiscovered economically recoverable resources are being used in this EIS. These new estimates were prepared by MMS based on current geological, geophysical, engineering, and economic data analyses of identifiable unleased hydrocarbon prospects, using the resource assessment methodology described in Appendix E. In previous EIS's for areawide lease sales, estimates of undiscovered recoverable resources were provided by the USGS Resource Appraisal Group (RAG) (as described in USGS Circulars 725 and 860).

b. Development Timetables

The estimated development timetable for offshore infrastructure and the production schedule for each sale are shown in Tables IV-2 and IV-3.

Central Gulf Sale 104: Exploratory activity takes place over an 11-year period (1987-1997), with the most intense level of activity occurring from 1990-1992; development activity begins in 1988 with the installation of the first production platform and ends in 1999 with the drilling of the last five production wells; and production of oil and/or gas takes place over the period 1988-2006. For additional data see Table IV-2.

Western Gulf Sale 105: Exploratory activity occurs from 1987-1997; development and production activity begins in 1988 with development activities being completed in 1999 and production activity extending through 2006. For additional data see Table IV-3.

c. Distribution of Resources and Offshore Infrastructure

The estimated distribution of resources recovered and related offshore infrastructure by subplanning area for each sale are shown in Tables IV-4 and IV-5. The subplanning areas are shown in Figure IV-1. The distributions are based on assumptions and estimates for the amounts and locations of oil and gas resources, their relative development potential, and industry interest in leasing data.

Central Gulf Sale 104: Exploration, development, and production activity is expected to occur in all four subplanning areas. Subplanning areas C-1, C-2, and C-3 are the heart of existing OCS development in the Gulf of Mexico, accounting for approximately 90% of existing offshore infrastructure. Subplanning area C-4 encompasses a relatively small area estimated to contain about 3% of the recoverable resources in the Central Gulf, thus accounting for the relatively small amount of estimated exploration, development, and production.

Western Gulf Sale 105: Exploration, development, and production activity is expected in all three subplanning areas; however, over 85% of the activity is estimated to be concentrated in subplanning areas W-1 and W-2 which are immediately adjacent to the Texas coast. Subplanning area W-3 is located over 100 miles from the Louisiana and Texas coastlines in water depths exceeding 200 m and contains a smaller amount of hydrocarbon resources with a high development potential, thus accounting for the lower level of expected exploration, development, and production. The WPA has already experienced a considerable amount of OCS development, particularly in subplanning area W-2 in water depths of less than 200 m.

Table IV-2

Estimated Development Timetable for Offshore Infrastructure: Central Planning Area - Sale 104

Year	Exploration and Delineation Wells Drilled			Platforms Installed			Production Wells Drilled			Miles of Pipeline Emplaced			Production: Oil (million bbls)			Production: Gas (bcf)		
	Scenario			Scenario			Scenario			Scenario			Scenario			Scenario		
	L	M	H	L	M	H	L	M	H	L	M	H	L	M	H	L	M	H
1986																		
1987	6	10	20			1			10			3			0.6			4
1988	15	20	40		1	2		5	20		3	6		0.3	2.7		2	18
1989	25	35	70	1	1	3	5	10	30	3	3	9	0.1	1.5	6.7	1	9	46
1990	35	70	140	1	2	5	5	20	50	3	6	47	0.6	3.8	13.5	4	22	90
1991	25	80	160	1	3	5	10	30	50	3	45	15	1.5	7.5	24.3	9	43	142
1992	15	50	100	1	3	4	15	30	50	3	12	12	3.0	13.5	27.0	17	68	206
1993	7	35	80	1	3	3	15	30	40	53	62	62	5.4	15.0	29.7	27	98	232
1994	6	25	45	1	2	3	10	20	40	3	6	9	6.0	16.5	32.4	40	111	284
1995	3	15	25	1	2	3	5	15	30	3	6	60	6.6	18.0	29.7	45	135	310
1996	3	15	15	1	1	2	5	10	20	33	68	68	7.2	16.5	24.3	55	148	284
1997		5	5		1	2	5	10	15	3	3	6	6.6	13.5	21.6	60	135	232
1998					1	2	5	10	15		3	6	5.4	12.0	16.2	55	111	181
1999						2		10	10		3	6	4.8	9.0	13.5	45	86	155
2000						2			10			6	3.6	7.5	10.8	35	74	129
2001						1			5			3	3.0	6.0	8.1	30	61	103
2002									5			2	2.4	4.5	5.4	25	49	77
2003													1.8	3.0	2.7	20	37	52
2004													1.2	1.5	0.8	15	25	26
2005													0.6	0.4		10	12	9
2006													0.2			5	4	
2007																2		
Total	140	360	700	8	20	40	80	200	400	107	220	320	60	150	270	500	1,230	2,580

Source: USDI, Minerals Management Service, Gulf of Mexico OCS Region estimates.

Table IV-3

Estimated Development Timetable for Offshore Infrastructure: Western Planning Area - Sale 105

Year	Exploration and Delineation Wells Drilled			Platforms Installed			Production Wells Drilled			Miles of Pipeline Emplaced			Production Oil (million bbls)			Production Gas (bcf)		
	Scenario			Scenario			Scenario			Scenario			Scenario			Scenario		
	L	M	H	L	M	H	L	M	H	L	M	H	L	M	H	L	M	H
1986																		
1987	6	10	20			1			10			4			0.4			4
1988	15	20	40		1	2		5	20		6	12		0.2	1.8		2	17
1989	20	35	60		1	3		10	30		6	18		1.0	4.5		9	43
1990	25	60	140	1	2	4	5	15	40	6	12	24	0.1	2.5	9.0	1	24	84
1991	25	60	100	1	3	5	10	20	50	6	18	27	0.3	5.0	16.2	4	47	132
1992	10	50	80	1	3	4	10	30	50	6	16	58	0.7	9.0	18.0	9	74	192
1993	7	35	60	1	3	3	15	20	30	6	15	15	1.5	10.0	19.8	17	107	216
1994	6	20	35	1	2	2	10	20	20	6	9	9	2.7	11.0	21.6	27	121	264
1995	3	15	25	1	2	2	5	15	15	6	8	8	3.0	12.0	19.8	40	147	288
1996	3	10	15		1	1	5	10	10	4	62	62	3.3	11.0	16.2	45	161	264
1997		5	5		1	1		10	10		4	5	3.6	9.0	14.4	55	147	216
1998					1	1		10	10		2	5	3.3	8.0	10.8	60	121	168
1999						1		5	5		2	4	2.7	6.0	9.0	55	94	144
2000									5			2	2.4	5.0	7.2	45	80	120
2001									5			2	1.8	4.0	5.4	35	67	96
2002													1.5	3.0	3.6	30	57	72
2003													1.2	2.0	1.8	25	40	48
2004													0.9	1.0	0.5	20	27	24
2005													0.6	0.3		15	13	8
2006													0.3			10	5	
2007													0.1			5		
2008																2		
Total	120	320	580	6	20	30	60	170	310	40	160	260	30	100	180	500	1,340	2,400

Source: USDI, Minerals Management Service, Gulf of Mexico OCS Region estimates.

Table IV-4

Estimated Distribution of Resources and Offshore Infrastructure by Subplanning Area: Central Planning Area - Sale 104

	C-1 Scenario			C-2 Scenario			C-3 Scenario			C-4 Scenario		
	L	M	H	L	M	H	L	M	H	L	M	H
Resources Recovered												
Oil (billion bbls)	0.015	0.04	0.07	0.03	0.07	0.13	0.015	0.04	0.07	(1)	(1)	(1)
Gas (tcf)	0.13	0.31	0.65	0.18	0.49	1.03	0.13	0.37	0.77	0.06	0.06	0.13
Infrastructure												
Exploration (2)	38	98	190	60	154	300	38	98	190	4	10	20
Platforms (3)	2	5	10	3	9	18	2	5	11	1	1	1
Production Wells	20	50	100	33	91	180	20	54	110	5	5	10
Pipeline (miles)	6	80	90	59	80	160	36	50	60	6	10	10

(1) Negligible.
(2) Includes delineation wells.
(3) Production.

Source: USDI, Minerals Management Service, Gulf of Mexico OCS Region estimates.

Table IV-5

Estimated Distribution of Resources and Offshore Infrastructure by Subplanning Area: Western Planning Area - Sale 105

	W-1 Scenario			W-2 Scenario			W-3 Scenario		
	L	M	H	L	M	H	L	M	H
Resources Recovered									
Oil (billion bbls)	(1)	0.01	0.02	0.02	0.08	0.14	(1)	0.01	0.02
Gas (tcf)	0.17	0.47	0.84	0.25	0.67	1.20	0.08	0.20	0.36
Infrastructure									
Exploration (2)	34	90	160	69	186	340	17	44	80
Platforms (3)	2	5	7	3	12	19	1	3	4
Production Wells	17	42	77	35	105	193	8	23	40
Pipeline (miles)	12	30	80	18	110	150	10	20	30

(1) Less than five million bbls.
(2) Includes delineation wells.
(3) Production

Source: USDI, Minerals Management Service, Gulf of Mexico OCS Region estimates.

d. Transportation Assumptions

Central Gulf Sale 104: It is assumed that oil and gas production will be transported by pipeline to existing onshore processing facilities in Louisiana, Mississippi, and possibly Texas. Up to three (0-3) new transmission pipeline landfalls are estimated (see discussion of onshore facility use estimates below).

Western Gulf Sale 105: It is assumed that oil and gas production will be transported by pipeline to onshore processing facilities in Texas and Louisiana. Possibly one (0-1) new transmission pipeline landfall is estimated (see discussion of onshore facility use estimates below).

e. Onshore Facility Use Estimates

Central Gulf Sale 104: Onshore support services and facilities for offshore drilling and production operations resulting from Sale 104 are estimated to be provided almost entirely from existing locations in Louisiana, Mississippi, Alabama, and Texas. Table IV-6 shows the major types and total numbers of existing and new support facilities estimated to be used in conjunction with offshore drilling and production, as well as their likely distribution by coastal subarea. The use of possibly one (0-1) new service base for development/production operations is estimated in coastal subarea C-4. The amount of land used for a new service base of this type is estimated at 35-75 acres. In addition, up to three (0-3) new transmission pipeline landfalls with up to 60 miles of onshore routing are estimated; with possibly one (0-1) landfall in each of coastal subareas C-1, C-2, and C-3. The amount of land used for each mile of onshore pipeline routing is estimated at 3-12 acres. All other onshore support activities are estimated to be readily provided from existing locations in the Central and Western coastal areas. Likely potential locations for the possible new service base include Harrison County (Long Beach-Biloxi area) and Jackson County (Pascagoula area) in Mississippi and Mobile County (Mobile-Bayou LaBatre area) in Alabama. Likely potential locations for the new pipelines include Cameron, Vermilion, Iberia, St. Mary, Terrebonne, Lafourche, Jefferson, Plaquemines, and St. Bernard Parishes (for analysis purposes not more than one pipeline landfall is assumed for any of these parishes).

Western Gulf Sale 105: Offshore drilling and production operations resulting from Sale 105 are estimated to be supported almost entirely from existing facilities located in Texas and Louisiana coastal areas. Table IV-7 provides data on the major types and total number of existing and new facilities estimated to be used in support of exploration, development, and production operations, and their expected distribution by coastal subsection. The use of possibly one (0-1) new service base for development/production operations is estimated in coastal subarea W-1. The amount of land used for a new service base of this type is estimated at 35-75 acres. Likely potential locations for the service base are Cameron, Willacy, Nueces, and San Patricio Counties. New production could result in the use of possibly one (0-1) new transmission pipeline with a potential landfall in coastal subarea W-1. The amount of land used for each mile of onshore pipeline routing is estimated at 3-12 miles. Likely potential locations for the new transmission pipeline landfall include each of the coastal counties located in coastal subareas W-1.

2. Cumulative Scenarios

These scenarios support the cumulative impact analyses which consider the aggregate future impacts to existing conditions that are estimated to occur as a result of the proposed actions (under the M Scenario), previous OCS sales, and major non-OCS activities that are pertinent. The cumulative impact analyses focus discussion on expected future impacts to existing environmental conditions. Impacts that have already occurred, or that are estimated to occur prior to the proposed actions (e.g., the impacts associated with past oil spill contacts, platform installation, pipeline construction, and support facility construction), are not added to the future impacts; however, these impacts are allowed to the extent that they have affected existing environmental conditions and problems. Impacts related to the continued use and maintenance of

Table IV-6

Onshore Facility Use Estimates: Sale 104 (M Scenario)

	Total		Coastal Subarea C-1		Coastal Subarea C-2		Coastal Subarea C-3		Coastal Subarea C-4		Coastal Subarea W-2	
Facility	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New
Service Bases												
Exploratory Drilling	22+	0	3+	0	5+	0	2+	0	1+	0	1+	0
Development/Production	8+	0-1	2+	0	3+	0	1+	0	1+	0-1	1+	0
Pipeline Installation	3+	0	1+	0	1+	0	1+	0	0	0	0-1	0
Pipe Coating Yard	3+	0	1+	0	1+	0	1+	0	0	0	0-1	0
Pipeline Landfall	7+	0-3	2+	0-1	2+	0-1	2+	0-1	1+	0	0-1	0
Miles Onshore Pipeline	5+	0-60	1+	0-20	1+	0-20	1+	0-20	1+	0	0-1+	0
Marine Terminal	0	0	0	0	0	0	0	0	0	0	0	0
Platform Fabrication Yard	3+	0	1+	0	1+	0	1+	0	0	0	0-1	0
Gas Processing Plant	3+	0	1+	0	1+	0	1+	0	0-1	0	0-1	0
Refinery	3+	0	1+	0	1+	0	1+	0	0-1	0	0-1	0

Note: The estimated acreage used for each type of new facility is listed in Table IV-42.

Source: USDI, Minerals Management Service, Gulf of Mexico OCS Region estimates.

Table IV-7

Onshore Facility Use Estimates: Sale 105 (M Scenario)

	Total		Coastal Subarea W-1		Coastal Subarea W-2		Coastal Subarea C-1/C-2	
Facility	Existing	New	Existing	New	Existing	New	Existing	New
Service Bases								
Exploratory Drilling	11+	0	4+	0	4+	0	3+	0
Development/Production	7+	0-1	3+	0-1	2+	0	2+	0
Pipeline Installation	3+	0	1+	0	1+	0	1+	0
Pipe Coating Yard	3+	0	1+	0	1+	0	1+	0
Pipeline Landfall	6+	0-1	2+	0	2+	0-1	2+	0
Miles Onshore Pipeline	6+	0-20	2+	0	2+	0-20	2+	0
Marine Terminal	0	0	0	0	0	0	0	0
Platform Fabrication Yard	3+	0	1+	0	1+	0	1+	0
Gas Processing Plant	4+	0	1+	0	1+	0	1+	0
Refinery	4+	0	1+	0	1+	0	1+	0

Note: The estimated acreage used for each type of new facility is listed in Table IV-42.

Source: USDI, Minerals Management Service, Gulf of Mexico OCS Region estimates.

existing (in place prior to the proposed sale) infrastructure, such as production platforms, onshore support and processing facilities, access waterways and pipelines, are considered in the cumulative analyses where they might be an important factor. Table IV-8 presents a summary of the major elements in the cumulative scenarios for the proposed actions. There are a number of other components of the cumulative scenario (not included in the summary table) that are discussed in the following sections and considered in the impact analyses. Additional information on the oil spill contact assumptions for these scenarios is included in Section IV.A.5.

a. Cumulative Scenario Factors Related to the Proposed Actions and Prior OCS Lease Sales

(1) Existing Reserves and Infrastructure

Table IV-8 includes data on existing OCS oil and gas reserves, offshore structures (multiwell platforms, single well, and other structures), and miles of pipeline constructed in the Central and Western Gulf. Visual No. 7 shows the location of the multiwell platforms and major oil and gas pipelines; also shown and tabulated are the major onshore oil and gas support and processing infrastructure (not all of this infrastructure is used exclusively or in part for Federal offshore oil and gas activity).

Data on the annual and cumulative construction of oil and gas pipelines in or originating in the Federal OCS are shown in Tables IV-13 (Central Analysis Area) and IV-14 (Western Analysis Area). These data indicate that approximately 90% of OCS pipeline segments and mileage are located in the Central Gulf of Mexico. Development in the Western Gulf of Mexico did not begin until 1965. Annual pipeline installations since 1970 have added between 300-1,300 miles (averaging 600 miles per year) to the existing network in Federal waters.

About 3% of the pipeline segments installed in the Federal OCS extend into State waters, where authorization is under State jurisdiction. MMS records indicate that 181 segments extend from the Federal OCS into State waters in the CPA and 10 segments in the WPA. Of the pipelines that were installed as a result of the Federal resource recovery program in the OCS, Gulf of Mexico, approximately 8% of the total mileage falls within State offshore waters. About 1,124 miles of pipelines in State waters are extensions of lines that originate in the Federal OCS; 1,004 miles of such lines are in Louisiana waters and 120 miles are in Texas waters. Of the pipelines that extend into State waters, some terminate at platforms and in subsea tie-ins with existing systems. Approximately 152 pipelines that originate in the Federal OCS extend through State waters and go ashore. Most of these (137) are in Louisiana, 2 are in Mississippi, and 13 are in Texas. During the 1970's, OCS pipeline landfall construction averaged 5.7 per year in the central coastal area and only 0.2 per year in the western coastla area. Since 1980 the average has dropped to 3.2 per year in the central coastal area and increased to 0.8 in the western coastal area.

(2) Estimated Future Offshore and Onshore Infrastructure and Production from the Proposed Actions and Prior OCS Sales

Table IV-8 includes the estimated additional amounts of resources expected to be developed (oil and gas production), new offshore and onshore infrastructure, and other impact producing factors related to the proposed actions and prior OCS sales in each planning area.

The estimated distribution of the resources expected to be developed (oil and gas production) and related infrastructure by subplanning area (Figure IV-1) are shown in Table IV-9 for the CPA and Table IV-10 for the WPA. The major types and numbers of existing and new onshore facilities estimated to be used in support of offshore development in the CPA including their distribution by coastal subarea, are shown in Table IV-11. Likely potential locations for new facilities in coastal subarea C-1 include Cameron, Vermilion, and Iberia Parishes, except that a pipeline landfall is not estimated for Iberia Parish. Likely potential locations for new facilities in coastal subarea C-2 include St. Mary, Terrebonne, and Lafourche Parishes. Likely potential loca-

Table IV-8

Cumulative Scenario: Summary of Major Elements

	Central Gulf Sale 104 (CPA)	Western Gulf Sale 105 (WPA)
A. Related to Federal OCS Activity		
Resources Expected to be Developed[1]		
Oil (billion bbls)	1.19	0.38
Gas (tcf)	10.61	5.66
Reserve Estimates[2]		
Oil (billion bbls)	3.22	0.20
Gas (tcf)	36.40	7.32
Offshore Infrastructure		
Existing (in place)		
Platforms[3]	2,800	256
Pipeline (miles)[4]	13,099	1,550
Additional[5]		
Exploration and Delineation Wells	2,160	1,220
Platforms (Production)	160	70
Production Wells	1,670	690
Pipeline (miles)[6]	1,090	650
Offshore Discharges[7]		
Drilling Mud Material (million bbls)	9.83	5.54
Drill Cuttings (million cubic yards)	1.09	0.62
Formation Water (billion bbls)	< 1.07	< 0.32
Offshore Air Emissions (thousand tons)[8]		
Nitrogen Oxides (NO_x)	223	29
Carbon Monoxide (CO)	44	6
Sulfur Oxides (SO_x)	1	< 0.5
Volatile Organic Compounds (VOC)	66	8
Total Suspended Particulates (TSP)	< 0.5	< 0.5
Transportation Activity[9]		
Vessel Traffic (1,000 trips)	217	42
Helicopter Traffic (1,000 trips)	2,140	239
Oil Spill Contact Assumptions[10, 11, 12]		
Large Spills (≧ 1,000 bbls)	7	4
Medium Spills (50-999 bbls)	18	11
Small Spills (1-49 bbls)	290	136
Onshore Facilities (new)[13]		
Service Bases	15	8
Pipe coating Yards	1	2
Pipeline Landfalls	13	5
Onshore Pipeline (miles)	260	100
Platform Fabrication Yards	2	1
Gas Processing Plants	3	2
Population Growth (thousands of new residents)[14]	4.0	2.2
B. State Offshore Oil and Gas Activity		
Platforms[15]	800	200
Pipelines (number/miles)[16]	120/1,200	31/320

Table IV-8. Cumulative Scenario: Summary of Major Elements (continued)

Production (annual)[17]		
Oil (million bbls)	24.3	2.3
Gas (billion cf)	316	148
Oil Spill Contact Assumptions[10, 11, 18]		
Large (≥ 1,000 bbls)	1	1
Medium (50-99 bbls)	4	2
Small (1-49 bbls)	80	48
C. Total Oil Spill Contact Assumptions[10, 11, 19]		
Large (≥ 1,000 bbls)	7	5
Medium (50-999 bbls)	22	13
Small (1-49 bbls)	370	184

[1] Estimated economically recoverable resources to be discovered and produced as a result of the proposed actions (under the M Scenarios) and prior sale activity occurring subsequent to the proposed action.

[2] Discovered economically recoverable resources as a result of prior sales (as of 12/31/83).

[3] Multiwell, single well, and other structure types as of 12/31/83.

[4] As of 12/84, includes state-permitted pipelines originating in Federal OCS waters.

[5] Related to resources expected to be developed.

[6] Gathering and transmission lines.

[7] Total discharges related to exploration and development activity.

[8] Peak year amounts related to exploration, development, and production activity.

[9] Number of trips (outbound plus inbound) for peak year activity.

[10] Assumed number of oil spills occurring and contacting land segments within 10 days for large and medium spills and within 3 days for small spills. See Section IV.A.5. for additional information.

[11] The assumed number of spill contacts is for a potentially affected coastal area delineated on the basis of land segments considered to have a reasonably foreseeable chance (1% or greater) of being contacted by an oil spill resulting from oil and gas development in the planning area to which the scenario applies. The coastal areas for the CPA and WPA are comprised of the land segments listed in Tables IV-19 and IV-20, respectively.

[12] The assumed numbers reflect the sum of the spill contacts with the potentially affected coastal area resulting from both proposed actions, existing leases in the Gulf of Mexico, and crude oil imports by tanker in the Gulf of Mexico.

[13] Maximum number in expected range. See Table IV-49 for estimated acreage for each type of new facility. See Table IV-11 (CPA) and Table IV-12 (WPA) for location by coastal subarea.

[14] Maximum (peak year) level (1987).

[15] Single well, multiwell, and other structure types as of 12/31/83.

[16] Estimates as of 1981.

[17] For 1983.

[18] Based on continued oil production in State offshore waters over the period 1986-2005.

[19] The total numbers reflect the sum of the spill contacts with the potentially affected coastal area resulting from both proposed actions, existing leases in the Gulf of Mexico, crude oil imports by tanker in the Gulf of Mexico (for spills of 1,000 bbls or greater), and continued oil production in State offshore waters over the period 1986-2005.

Table IV-9

Cumulative Scenario: Estimated Distribution of Resources and Offshore Infrastructure by Subplanning Area for the Proposed Action (Sale 104) and Prior Sales in the Central Planning Area

	C-1	C-2	C-3	C-4	Total
Resources Recovered					
Oil (billion bbls)	0.28	0.41	0.45	0.05	1.19
Gas (tcf)	2.66	4.24	3.18	0.53	10.16
Infrastructure					
Exploration and Delineation Wells	534	824	704	98	2,160
Platforms (production)	38	59	55	8	160
Production Wells	400	621	572	77	1,670
Pipeline (miles)	300	380	320	90	1,090

Source: USDI, Minerals Management Service, Gulf of Mexico OCS Region estimates.

Table IV-10

Cumulative Scenario: Estimated Distribution of Resources and Offshore Infrastructure by Subplanning Area for the Proposed Action (Sale 105) and Prior Sales in the Western Planning Area

	W-1	W-2	W-3	Total
Resources Recovered				
Oil (billion bbls)	0.21	0.12	0.06	0.38
Gas (tcf)	1.98	2.83	0.85	5.66
Infrastructure				
Exploration and Delineation Wells	488	550	182	1,220
Platforms (production)	30	30	10	70
Production Wells	298	289	103	690
Pipeline (miles)	220	250	180	650

Source: USDI, Minerals Management Service, Gulf of Mexico OCS Region estimates.

Table IV-11

Cumulative Scenario: Onshore Facility Use Estimates for the Proposed Action (Sale 104) and Prior Sales in the Central Planning Area

	Total		Coastal Subarea C-1		Coastal Subarea C-2		Coastal Subarea C-3		Coastal Subarea C-4		Coastal Subarea W-2	
Facility	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New
Service Bases												
Exploratory Drilling	23+	0-4	6+	0-1	10+	0-1	5+	0-1	1+	0-1	1+	0
Development/Production	25+	3-10	8+	1-2	10+	1-4	6+	1-2	0-1	0-2	1	0
Pipeline Installation	3+	0-1	1+	0	1+	0	1+	0	0-1	0-1	0-1	0
Pipe Coating Yard	3+	0-1	1+	0	1+	0	1+	0	0-1	0-1	0-1	0
Pipeline Landfall	6+	2-13	2+	0-3	2+	1-5	2+	1-4	0-1	0-1	0-1	0
Miles Onshore Pipeline	4+	15-260	1+	0-60	1+	10-100	1+	5-80	1+	0-20	0-1+	0
Marine Terminal	0	0	0	0	0	0	0	0	0	0	0	0
Platform Fabrication Yard	4+	0-2	1+	0-1	1+	0-1	1+	0	1+	0	0-1	0
Gas Processing Plant	7+	0-3	2+	0-1	2+	0-1	2+	0-1	1+	0	0-1	0
Refinery	4+	0	1+	0	1+	0	1+	0	1+	0	0-1	0

Note: The estimated acreage used for each type of new facility is listed in Table IV-49.

Source: USDI, Minerals Management Service, Gulf of Mexico OCS Region estimates.

tions for new facilities in coastal subarea C-3 include Jefferson, Plaquemines, and St. Bernard (pipeline landfall only) Parishes. Likely potential locations for new facilities in coastal subarea C-4 include Jackson County, Mississippi, and Mobile County, Alabama.

Table IV-12 shows the major types and numbers of existing and new facilities estimated to be used in support of offshore drilling and production operations in the WPA including their distribution by coastal subarea. Likely potential locations for new facilities in coastal subarea W-1 include Cameron, Willacy, Kenedy (a possible pipeline landfall and a possible gas processing plant only), Nueces, San Patricio, Aransas, and Calhoun Counties. Likely potential locations for new facilities in coastal subarea W-2 include Brazoria, Galveston, Jefferson, and Matagorda Counties, except that no service bases are estimated for Matagorda County. Likely potential locations for a possible new facility in coastal subarea C-1/C-2 include Cameron and Vermilion Parishes.

b. State Offshore Oil/Gas Activities

The States of Texas and Louisiana have experienced offshore oil and gas exploration, development, and production ativities for over 30 years.

The cumulative number of offshore wells (defined as those producing from beyond natural shorelines) drilled in State waters as of January 1, 1983, has been significant (American Petroleum Institute, 1984): Louisiana - 3,981 wells; Texas - 1,094 wells; and Florida - 15 wells.

In Texas offshore waters, accumulated oil and gas production to January 1, 1984, was 26.1 million bbls of oil and 2,877 billion cubic feet of gas. Annual oil production peaked in 1977 at 2.6 million bbls; by 1982 production was down to 1.8 million bbls; however, in 1983 production increased to 2.3 million bbls. Annual gas production peaked in 1980 at 254 billion cubic feet and by 1983 annual production had declined to 148 billion cubic feet. In Louisiana offshore waters, accumulated oil and gas production to January 1, 1984, was 1,338.4 million bbls and 9,654 billion cubic feet, respectively. Annual oil production peaked at 72.1 million bbls in 1970 and declined to 24.3 million bbls in 1983. Annual gas production reached a peak of 604 billion cubic feet in 1972, thereafter steadily declining to 316 billion cubic feet in 1983 (USDI, MMS, 1984d).

The estimated number of offshore oil and gas structures (platforms and other structures) in Texas and Louisiana State waters as of December 31, 1983, were are estimated at about 200 and 800, respectively (USDI, MMS, 1984d).

Comprehensive information on oil and gas activities in State waters in the Gulf of Mexico region has not been compiled. In addition, many activities carried out prior to the 1950's were not documented or permitted in the way they are now and information is scarce or lacking (Groat, Personal communication, 1984).

For Louisiana, some information is available on leasing for the years 1960 to the present. The Louisiana Mineral Board, which was created in 1936, conducts lease sales monthly. Between 1962-1982, the State leased 800,779 acres offshore. Between January 1980 and August 1983, the State awarded 235 leases, which totalled 223,740 acres offshore. Between 1967-1982, approximately 6,553 wells were drilled in Louisiana's State waters (Walton, Personal communication, 1984).

Pipelines that are located entirely within State offshore waters, wetlands, and uplands do not require permits from MMS and an accurate data base for such lines is apparently not readily available. Estimates based on maps published by the State of Louisiana (Louisiana Geological Survey 1981) and industry sources indicate that approximately 120 such pipelines, totaling 1,200 miles in length have been permitted within Louisiana's offshore waters, and 31 lines totaling approximately 320 miles have been permitted in Texas' waters. Of these, approximately 90 pipelines go ashore in Louisiana, 2 in Mississippi, and 24 in Texas. Approximately one-fifth of the pipelines that go ashore in Louisiana have multiple landfalls intersecting the coast at several locations.

Table IV-12

Cumulative Scenario: Onshore Facility Use Estimates for the Proposed Action (Sale 105) and Prior Sales in the Western Planning Area

	Total		Coastal Subarea W-1		Coastal Subarea W-2		Coastal Subarea C-1/C-2	
Facility	Existing	New	Existing	New	Existing	New	Existing	New
Service Bases								
Exploratory Drilling	11+	0-2	5+	0-1	3+	0-1	3+	0
Development/Production	11+	0-4	5+	0-2	3+	0-1	3+	0-1
Pipeline Installation	3+	0-2	1+	0-1	1+	0-1	1+	0
Pipe Coating Yard	3+	0-2	1+	0-1	1+	0-1	1+	0
Pipeline Landfall	3+	0-5	1+	0-2	1+	0-3	1+	0
Miles Onshore Pipeline	4+	0-100	1+	0-40	1+	0-60	1+	0
Marine Terminal	0	0	0	0	0	0	0	0
Platform Fabrication Yard	4+	0-1	1+	0-1	1+	0	2+	0
Gas Processing Plant	4+	0-2	1+	0-1	1+	0-1	2+	0
Refinery	4+	0	1+	0	1+	0	2+	0

Note: The estimated acreage used for each type of new facility is listed in Table IV-49.

Source: USDI, Minerals Management Service, Gulf of Mexico OCS Region estimates.

c. Other Major Offshore Activities

(1) Marine Transportation

The Gulf of Mexico is one of the busiest areas in the world for waterborne commerce. Vessels operating offshore often utilize the extensive network of established safety fairways as shown on Visual No. 11 and previously discussed in Section I.B.4.a. The fairways provide clear passage, 2 nmi in width, for vessels travelling to and from major Gulf ports. Many of the shallower draft vessels, especially barges, generally use the GIWW which follows most of the Gulf coastline inshore and through the bays and estuaries from Fort Myers, Florida, to Brownsville, Texas. In 1982, there were 432,628 recorded vessel trips to and from Central and Western Gulf ports; 268,340 in the CCA and 164,288 in the WCA.

(2) Ocean Dumping

There is one USEPA designated dump site in the Gulf of Mexico; it is presently reserved for incineration at sea, but there are no active permits for incineration at sea. This site is located in deepwater seaward of the continental shelf. See Section I.B.6.e. for a discussion of ocean dumping.

(3) Military Use

Ten percent of the water and air space of the Central Gulf is used extensively but not intensively by the Navy, Naval Reserve, and Air National Guard for carrier flight qualifications, and pilot training. Thirty-seven percent of the water and air space of the Western Gulf is used by the Air Force and Navy for carrier flight qualifications, bombing runs, navigation exercises, and pilot training. Warning Area 228 is used intensively by the Navy within a radius of 150 miles of Corpus Christi and less beyond the 150-mile radius, and Warning Area 602 is used extensively but infrequently by the Air Force. All military warning areas and water test areas for the Gulf of Mexico are shown on Visual No. 11.

(4) Recreational Fishing

Saltwater fishing is a marine recreational activity that is growing in participation and economic significance throughout the inshore, nearshore, and offshore zones of the Gulf of Mexico region. Results from the National Marine Fisheries Service's (NMFS) Statistical Survey indicate that about four million saltwater fishermen in the Gulf region made about 20 million fishing trips during 1980. Fishing from boats is the most popular mode of marine recreational fishing in the Gulf region (over 50% of all fishing trips). In 1982 over 1.7 million motor boats, approximately one-fifth of the Nation's recreational boating fleet, were registered in the five states of the Gulf region. Over 700,000 of these motor boats are 16 feet or larger or potentially capable of navigating in the nearshore and offshore zones of the Gulf of Mexico.

The focus of most offshore fishing is around natural and artificial features where fish are likely to be located. Demand for artificial fishing reefs, especially in the Eastern Gulf, has increased in the last few years. Over 120 designated and permitted artificial fishing reefs composed of ships, barges, tires and concrete rubble have been placed in the Gulf of Mexico over the past 25 years. Increasing interest in the reuse of obsolete oil and gas structures for artificial reefs has led to a Gulfwide interest in a rigs-to-reefs program. To date about six oil and gas structures have been converted to permanent fishery enhancement devices on dedicated reef sites.

(5) Commercial Fishing

NMFS landings data for 1977-1981 show approximately 1.68 billion pounds of finfish and shellfish with an annual dockside value of $429.8 million in the Central and Western Gulf. Important species landed commercially in the Gulf include shrimp, menhaden, blue crab, oyster, mackerels, drums, seatrouts, snappers, and groupers. There are approximately 27,336 commercial fishermen Gulfwide with processed fishing products amounting to about $515.3 million. The main processed fishery products include shrimp, menhaden, lobsters, oysters, and crabs.

(6) Deepwater Ports

The Louisiana Offshore Oil Port (LOOP) is the only deepwater port in the Gulf of Mexico. LOOP's function is to facilitate the offloading of oil from vessels too large to visit conventional Gulf ports (typically supertankers with drafts greater than 40 feet and up to 700,000 dwt) and to transport the oil to shore via pipeline. In 1983, LOOP offloaded 140.9 million bbls of crude oil from 168 tankers. No mobile drilling operations or installation of permanent structures may take place within LOOP's designated safety zone, fairway, or anchorage. For additional information, see Section I.B.6.b.

(7) Non-Energy Minerals Program in the Gulf of Mexico

The Non-Energy Minerals program in the Gulf of Mexico is currently inactive. Earlier planning had tentatively called for a construction materials lease sale for January 1986; however, this schedule is no longer in effect and no new tentative sale date is known.

Interest in authorizing a lease sale in the Gulf of Mexico continues and legislation was introduced and passed the House of Representatives; however, the proposed bill in the Senate failed to pass out of committee in 1984. Future legislation may be introduced in the near future if local support for the measure is noted.

(8) Operational Discharges

Contamination from marine transportation activities occurs as a result of routine operational discharges and accidental spills. With respect to ships that maintain sizeable crews, the pollutants consist of large amounts of domestic waste products such as sewage, food waste, and trash from the human activities on board. For recreational vessels, sewage disposal from marine sanitation devices in highly populated, confined harbors and anchorages is the primary pollution concern. Other problems are related to the movement of crude oil and concern offshore unloading terminals (deepwater ports) and identification of systems most reliable for transfer of oil from OCS production areas to shorewide facilities. Perhaps the most publicized source of pollution is operational discharge of oil by tankers in the merchant marine fleet. Because tankers cannot safely navigate ocean waters with empty tanks, they take on seawater as ballast after the cargo is discharged. When a ship gets close to its loading destination, the ballast water is discharged to make room for the oil cargo. Thus, the ballast seawater, contaminated with oil from the previous cargo or from tank washing, is sometimes intentionally discharged into the ocean. It has been estimated by MMS and others that the annual input of petroleum into the Gulf of Mexico, resulting from operational discharges, equals 59,000 bbls per year or 2.6% of the total amount of petroleum entering the Gulf annually (USDI, MMS, 1982a).

d. Major Onshore Activities in Coastal Areas

(1) Oil and Gas Facilities

The central and western coastal portion of the Gulf Coast has one of the highest concentrations of oil and gas activities and related and service-support processing infrastructure in the world. This infrastructure includes: service (supply) bases; platform fabrication yards; pipecoating yards; gas processing plants and oil refineries; and other related installations. Visual No. 7 indicates the location of these facilities both graphically and in tabular format. The tabular format on the back of the visual includes the company name, capacity, and location of all gas processing plants and refineries.

Comprehensive information on the extent of oil and gas activities in the coastal area of the Gulf of Mexico region has not been compiled. For many activities, particularly those prior to 1950, information is scarce or lacking. In Louisiana, virtually all privately-owned lands in the coastal area have been leased for oil and gas development. For Louisiana, there are approximately 34,200 wells in the coastal area (which includes the following parishes: Cameron, Iberia, Jefferson, Lafourche, Orleans, Plaquemines, St. Bernard, St. Charles, St. John the Baptist, St. Mary, Terrebonne, and Vermilion).

Access canals and pipelines to service onshore development are pervasive throughout the coastal area. Between 1978 and 1982, approximately 1,900 petroleum canals were dredged in coastal Louisiana to provide access to well sites. The typical dimensions of an oil and gas access canal, as indicated on permits, are as follows: a canal 1,200 feet long and 70 feet wide with a drill slip at the end measuring 345 by 160 feet. The cumulative linear extent of canals, including oil and gas access canals, in coastal Louisiana has been estimated at 6,100 miles in 1984 (U.S. Army Corps of Engineers, 1984b). For pipelines, estimates of the total number and linear extent vary widely. Between October 1980 and January 1983, coastal use permits were granted for 860 buried pipelines in the Louisiana coastal area.

Canalization contributes directly to the loss of wetlands through dredging activities, spoil disposal and canal widening, and indirectly through hydrologic interruptions. Canals also act as conduits for the inland movement of comparatively saline water which damages freshwater wetlands.

Well site construction activities include the construction of board roads and ring levees. Ring levees are approximately 4-acre impoundments constructed around a well site. The area of wetlands impounded by ring levees during the past decade is probably extensive.

Although no specific information is available at this time, the disposal or leakage of saline water into wetlands may have a significant local impact near well sites.

Limited research has been conducted in Louisiana on the effects of hydrocarbon extraction on surface subsidence. A recent study in Louisiana indicates that there is a correlation between anomalous subsidence and drilling operations (Trahan, 1984, Personal communication). In other coastal oil and gas producing regions where the problem has been more extensively studied (Texas, California, and Venezuela), oil companies are required to address the issue of subsidence in their development plans and take appropriate corrective measures (Boesch et al., 1983).

(2) Channelization, Dredging, and Mississippi River Flood Control Measures

The establishment of intercoastal waterways, irrigation and drainage canals, and access channels has resulted in extensive channelization and attendant disposal of dredge spoil throughout the coastal zone. Cuts have been made on land and in bays, estuaries, and tidal flats. Major environmental consequences of channelization and disposal of spoil in banks and piles are: (a) alteration or modification of on-land drainage patterns; (b) tendency to dam wetlands and shallow water bodies into isolated compartments, inhibiting natural circulation and altering temperature and salinity gradients; and (c) creation of unstabilized, easily eroded sediments that are reworked and redistributed by storms, normal waves, currents, and stream runoff.

Alterations in the hydrology of the Mississippi River basin have caused declines in sedimentation rates and have contributed to marsh deterioration in the coastal wetlands of Louisiana in recent decades. Coastal marshes appear to expand or diminish in areal extent according to the amount of sediment available, and sedimentation is the limiting factor controlling marsh growth. It is a natural system; overbank flooding is a major mechanism of introducing sediment-laden waters into adjoining wetlands. Therefore, flood control levees on the lower Mississippi River and its distributaries have resulted in wetlands loss because levees eliminate overbank flooding and prevent the distribution of alluvial sediments across the delta.

Sediment deprivation is also the result of a decrease in the sediment load of the Mississippi River as a result of river bank stabilization projects and upstream reservoir regulations. Land use changes, such as scientific soil conservation and reforestation programs within the basin, may also have contributed to the decrease in suspended sediment load of the river.

(3) Filling and Land Reclamation

Artificial filling of shallow coastal water bodies and low-lying marshes creates valuable shorefront development land or additional land for industrial expansion. The process also permanently destroys parts of vital natural environments, alters shoreline configurations, modifies natural patterns of circulation and sediment dispersal, and commonly creates unstabilized and easily erodable substrates.

(4) Shoreline Construction

Construction of groins, piers, and jetties, as well as channel widening and deepening and dredge disposal, have modified the circulation and sediment availability and transport patterns along the Gulf coastline and within the bays and estuaries. The erosion and accretion of a shoreline is largely controlled by natural processes, of which sediment supply and wave energy are key factors. Shoreline construction, whether in the form of shoreline control or development, can affect the natural processes and the rate at which they work.

(5) Population Growth

This is considered a major impact producing factor because it increases the demand for, and use of, community services and facilities (both public and private) such as education, police and fire protection, water supply and treatment, sewage treatment, solid waste disposal, water supply, recreation, transportation, health care, utilities, and housing. Such increases could cause reductions in the quality of a service and other adverse effects (e.g., fewer, less frequent services; crowding or congestion of facilities; shortages in supply; reductions in service standards). Population growth is also associated with the expansion of residential and commercial, public and semi-public land use and the related potential conflicts and impacts on existing environmental resources. The 1985 total population estimates and the projected average annual increase (population growth) is indicated for the potential affected coastal counties in Tables IV-48 and IV-62.

(6) Waste Disposal

A significant activity in the coastal zone is the disposal of waste, particularly in the more populated and industrialized areas. Although many wastes are treated and discharged into water bodies and others are incinerated, a large volume of wastes are disposed of beneath or on land. Land disposal of waste may result in pollution of groundwater aquifers or surface water bodies in the event the host soils are permeable and the groundwater table is high.

e. Natural Events and Processes

(1) Natural Catastrophies

Several kinds of major natural processes create particular problems in the coastal zone. These include: hurricanes, which, through high and intense flood surges, may breach barrier islands and dunes, flooding low-lying coastal areas; shoreline erosion under normal and storm conditions; inland flooding along floodplains; and surface faulting and land subsidence.

(2) Natural Oil and Gas Seepage

Historical and contemporary data indicate that hydrocarbon seepage has been, and is, occurring in the Gulf of Mexico and elsewhere in the petroleum provinces of the world. It has proven difficult to pinpoint oil seeps in the deeper water areas of the Gulf, although many areas having anomalous concentrations of hydrocarbons in the water column are recorded on subbottom profiler records. They have also been detected and analyzed with chemical "sniffers." Some of these seeps occur at a considerable distance from commercial production.

(3) Submergence of Coastal Wetlands

The submergence of coastal wetlands in the Gulf of Mexico region contributes to a loss of 50 square miles of land per year in coastal Louisiana. Recent studies indicate that the submergence rate in Louisiana is 1.2 cm per year. The submergence rate at which wetlands deteriorate is variable depending on local sedimentation rates. The submergence rate critical for the stability of Louisiana marshes has not been determined. The major natural factors contributing to this submergence are: (a) a eustatic rise in sea level and (b) coastal subsidence. An additional discussion of these factors is provided in Appendix D of Final EIS 94/98/102.

During this century, the rate of rise of sea level has increased to 12 cm per century (Gagliano et al., 1981) and therefore may account for 10% of the observed submergence in Louisiana. It is not known whether this modern acceleration in the rate of rise of sea level is a short-term deviation from a slower long-term rate or whether it is a continuing process associated with a global climatic warming trend.

Approximately 90% of the submergence of coastal wetlands in Louisiana is the result of subsidence of the land (DeLaune et al., 1983). The primary processes responsible for land subsidence are geosynclinal downwarping; compaction, dewatering, and flow of recent sediments; and fluid withdrawal (hydrocarbons and water). It is not possible to quantify the contribution that each of these processes makes to the observed subsidence in coastal Louisiana.

3. Other Scenarios

Low, High, and Total Find Scenarios are described and briefly analyzed for the CPA in Section IV.D.1.d. and for the WPA in Section IV.D.2.d. The oil spill contact assumptions for these scenarios are included in Section IV.A.5.

4. Impact Producing Factors Related to Routine Offshore Activity

a. Discharge of Treated Drilling Muds, Cuttings, and Produced Formation Waters

The discharges made in drilling OCS oil and gas wells have recently been the subject of research and public debate with regard to their potential effects on the marine environment. A lack of scientific consensus about the physical fates and biological effects of these discharges had led to actions contesting the permitting of some drilling discharges. The following discussions were taken from the National Academy of Sciences (1983) and the Final Regional EIS.

Drilling fluids are required in rotary drilling for oil and gas exploration and development to remove cuttings from beneath the bit, to control pressure in the well, to cool and lubricate the drill string, and to seal the well. There are no alternatives to using drilling fluids in this rotary drilling. Although drilling fluids are recirculated during drilling and sometimes can be held and reused in drilling multiple production wells, eventually they must be disposed of because of their contamination with suspended material or their loss of important properties or because of weight and space limitations on drilling vessels. Cuttings from the formation drilled are removed from the drilling fluid and must also be disposed of. Although drilling discharges can be barged ashore or to other sites at sea for disposal, cost and operational considerations favor onsite disposal by either overboard discharge or shunting through a pipe to some depth. Land disposal is now required for certain drilling fluids (for example, oil-based drilling fluids) and in certain State waters (State waters of Alabama).

Drilling fluids used on the OCS are composed of bulk constituents and special purpose additives. The principal bulk constituents are water, barite (barium sulfate), clay minerals, chrome lignosulfonate, lignite, and sodium hydroxide. All of these constituents are nontoxic to marine organisms at the dilutions reached shortly after discharge. There is limited information on the compositions and quantities of additives in used fluids discharged on the OCS. Several common drilling-fluid additives, including biocides and diesel fuel (No. 2 fuel oil), are much more toxic to marine organisms than the bulk constituents.

Drilling fluids consist of a number of materials and chemicals added to water to perform a variety of functions necessary to the drilling operations (Offshore Operators Committee, 1976). These fluids, commonly called "muds," perform a variety of functions in drilling a well, such as cooling the drill bit, maintaining downhole pressure, and bringing cuttings to the surface. For detailed descriptions of the use of muds, see Appendix E of the Final EIS for Sale 65, Offshore Operators Committee (1976).

Using 10,000 feet as an "average" well depth, estimated total volumes of muds and cuttings discharged resulting from both sales are as follows (using figures from Offshore Operators Committee, 1976): (1) exploration and delineation under the M Scenario (Table IV-1), 680 wells (360 in the CPA, 320 in the WPA); 347,480 yd^3 of cuttings (183,960 yd^3 in the CPA, 163,520 yd^3 in the WPA), and 3,094,000 bbls of muds (1,638,000 bbls in the CPA, 1,456,000 bbls in the WPA); and (2) production, 370 wells (200 in the CPA, 170 in the WPA); 189,070 yd^3 of cuttings (102,200 yd^3 in the CPA, 86,870 yd^3 in the WPA), and 1,683,500 bbls of muds (910,000 bbls in the CPA, 773,500 bbls in the WPA). This sounds like, and indeed is, a great deal of material, but it must be kept in mind that these amounts will be discharged into a very large body of water in which dilution and dispersion is rapid (i.e., four or five orders of magnitude within 10 m of the discharge point) and that such a discharge will be over a period of several years. Assuming that drilling from this proposal takes place over 13 years, an average of 80,770 tons of muds solids a year will be discharged.

Approximately two million metric tons (dry weight) of drilling-fluid components are discharged annually on the United States OCS, more than 90% of this amount in the Gulf of Mexico. Corresponding figures in the future will depend on government leasing policies, successes in exploration, and economic factors; but, in the near future most drilling discharges are likely to occur in the Gulf of Mexico and off southern California and Alaska. Compared to the mass emissions of river sediments and those of municipal wastes and dredged material, the quantity of drilling fluids discharged in the ocean is small. For example, total particulate loading in the Gulf from drilling fluids represents about 1% of that from the Mississippi River. Annual discharges of dredged material, sludge, and industrial wastes in United States coastal waters exceed those of drilling fluids.

Discharges of drilling fluids and cuttings into OCS waters take place in a wide range of marine environments, which vary greatly in water depth, ice cover, tidal and nontidal currents, waves, geological history, land runoff, and biotic characteristics. Thus, the physical fates of discharges, drilling fluids, and cuttings vary greatly. On the OCS, approximately 90% of the particles in discharges, drilling fluids, and almost all of the cuttings settle rapidly, passing through a stage of convective descent until encountering the seabed or becoming neutrally buoyant. In addition to the main, or lower plume, a visible or upper plume is also formed. Most observations of water column fate have focused on the upper plume and on the dispersion of dissolved components. Based on observations of upper plumes, the plumes are spread out at some depth appropriate to density characteristics and are rapidly dispersed by the turbulent diffusion characteristics of the ocean. Horizontal turbulent diffusion results in dilution of the plumes by a factor of 10,000 or more within an hour of release and an even greater dilution of suspended components because of settling.

More than 96% of the whole drilling fluids tested in short-term experiments (from 44-144 hours) have LC50 values greater than 1,000 ppm (which are achieved in offshore oil and gas drilling activities only within a few meters of the discharge point) and are classified as "slightly toxic" or practically "nontoxic" by the IMCO et al. (1969) characterization of toxicity. More than 98% of the tests that have used the suspended particulate phase of drilling fluids found their LC50 values greater than 10,000 ppm (in the range of "practically nontoxic"). This distribution of toxicities, representing over 70 drilling fluids and more than 60 species of marine organisms, indicates that most water-based drilling fluids are relatively nontoxic (NAS, 1983).

There is concern regarding the environmental impacts of these drilling muds and cuttings. A 3½ day symposium on Research on Environmental Fate and Effects of Drilling Fluids and Cuttings was held in Orlando, Florida, on January 21-24, 1980 (Symposium, 1980). Based on that symposium and numerous reports of government and industry sponsored research, two positive statements can be made: (a) many muds used in normal offshore drilling operations do indeed contain materials, such as chromium, toxic to marine organisms, but only at concentrations four or five orders of magnitude higher than those found more than a few tens of meters from the discharge point; and (b) dilution is extremely rapid in offshore waters to the extent that every substance measured in the water column, including turbidity, is at background certainly by a distance of 2,000 m, and probably within 1,000 m. Neff (1981) and Petrazzuolo (1981) confirm this. Menzie (1983) states that in several studies of the effects of drilling effluents that "Bioassays had revealed that the drilling discharges had little toxicity and it was thought unlikely that the observed effects were the results of toxicants." The observed effects were reduced benthic invertebrate abundance, and was attributed to a change in sediment type (see below). In another study performed for Exxon, drilling fluids were discharged into Gulf waters at a high rate. The study (Ecomar Inc., 1980) came to the following conclusions:

> Due to settling and dilution, suspended solids levels and metal concentrations drop quickly with distance near the discharge source. Concentration decreases of three to four orders of magnitude occur within 100 m downcurrent of the discharge source. Concentrations continue to fall, but at a slower rate, as the plume moves further away. Concentration decreases of five to six orders of magnitude occur at distances of 500-1,000 m. Soluble component concentration decreases were estimated to be some two orders of magnitude less than those observed for the suspended solids.

Furthermore, the National Academy of Sciences (NAS, 1983) recently made a comprehensive study of the fate and effects of drilling fluids in the marine environment. Because of the authoritative nature of the NAS review, the conclusions of that report were extensively summarized in Section IV.D.1.a.(2) of Final EIS 94/98/102. In brief, the report concluded:

> This review of existing information on the fates and effects of drilling fluids and cuttings on the OCS shows that the effects of individual discharges are quite limited in extent and are confined mainly to the benthic environment. These results suggest that the environmental risk of exploratory drilling discharges to most OCS communities are small. Discharges from oil and gas field development drilling introduce greater quantities of material into the marine environment over longer periods of time. Results of field studies suggest that the accumulation of materials from these longer-term inputs is less than additive and therefore the effects of exploratory drilling provide a reasonable model for projecting the effects of development drilling. Uncertainties regarding effects still exist for low energy depositional environments which experience large inputs of drilling discharges over long periods of time.

Thus, the NAS concluded that drilling fluids used in OCS oil and gas exploration and development activities do not cause any significant ecological damage beyond 1,000 m either in the short-term or long-term.

This view was even more recently reiterated. At a "Mobile Bay Area Drilling Fluids Transport Workshop" held on December 6-8, 1983, the Biological Resources subgroup came to the following conclusion:

> We recognize that some area around the drilling activity (roughly a 200 m radius area) will be essentially buried by drilling cuttings and muds, and thus it is essential that such activities not take place immediately upon areas of particular biological concern or sensitivity (such as oyster reefs; coral reefs). This burial may result in the death of many benthic organisms, but recovery is generally rapid, depending upon several factors such as depth of burial and the extent to which the grain size of the discharged materials differs from that of the natural sediments. Dispersion of the cuttings pile and biological reworking of the materials takes place quickly, on the order of several months to a year. Toxicity does not seem to be a problem at the concentrations of material found at distances greater than 200-500 m from the discharge point, and certainly not at distances greater than 1,000 m. Most of the toxicity seems to be due to the presence of 3%-6% diesel oil in the discharges. Eliminating the use of diesel may reduce toxicity to insignificant levels. Mechanical damage to hard bottom communities from rig, platform, and pipeline emplacement and from anchors from crew, supply, and work boats is probably the greatest threat to such areas from oil and gas activities and should be avoided.

In addition to toxic effects, the discharges, particularly the cuttings, form a low mound on the bottom beneath the discharge. Approximately 511-961 yd^3 of cuttings are disposed of during the drilling of an exploration well, depending on the depth of the well. Nonmotile plants and animals covered by this mound may be smothered, and to the extent that this mound exhibits different substrate characteristics (such as grain size, organic content, etc.) from the original bottom, the plants and animals which colonize the mound will be different. However, observations on such mounds show that they are colonized and reworked, and that after some period of time become indistinguishable from the surrounding bottom (Zingula, 1975). Furthermore, Menzie (1983) points out that it is the physical change of the substrate rather than any toxic effects which causes a change of benthic fauna around drilling rigs.

All the above notwithstanding, the direct discharge of muds and cuttings on small and productive areas such as coral reefs and live bottoms would devastate delicate ecological relationships and the resulting change in sediment characteristics could prevent recovery of the predrilling condition.

Formation waters or produced waters are classified as all waters and particulate matter associated with oil and gas producing formations. The lower edge or down-dip boundary of most oil and gas pools is marked by an oil-water or gas-water contact. The amount of produced water generated is primarily dependent on the method of oil production, field characteristics, and location. As oil and gas production declines, most wells produce increasing amounts of free water; therefore, the age of a production field can impact the quantity of wastewater generated. In some pools, water comes with the oil in early stages of development; whereas in others, appreciable water never comes up with the oil. The period prior to initiating treatment of these waters is variable, depending on the characteristics of the particular field, and can be affected by the method of recovery.

Produced water production may vary from less than 1%-90% of the production fluids. These waters may be high in total dissolved solids (TDS), oxygen demanding wastes, and toxic materials, in addition to oil and grease contaminants (U.S. Environmental Protection Agency, 1976). Typical sodium concentrations range from 23,000-57,000 mg/l with typical calcium concentrations existing between 2,500-25,800 mg/l and those for magnesium for 100-5,000 mg/l.

Metal ions present in the highest concentrations are those which are common either to seawater or many terrestrial deposits and are not considered hazardous at the low concentrations observed, except those very close to the discharge source. Those metals generally considered as toxic are present at very low concentrations, often below the level of detection of even the sensitive methods used. The metals which would be of greatest concern in the environment are those which are toxic in concentrations of parts per million or less. To consider any possible hazards in discharging produced waters containing toxic metals in the marine environment, it is necessary to consider: (1) the concentration of trace metals in produced waters; (2) the concentration of trace metals in normal seawater; and (3) the toxicity levels of toxic metals. With the exception of Cu, Cr, Mn, and Sr, the concentration of trace metals in produced waters is not much different than that normally found in seawater. The six most toxic elements for marine organisms are considered to be mercury (Hg), cadmium (Cd), silver (Ag), nickel (Ni), selenium (Se), and lead (Pb). Produced waters do not normally contain concentrations of these six elements greater than those found in seawater. Attention has been paid to the determination of the two most toxic elements (Hg and Cd) in effluents from a number of crude oil offshore production units. In essentially all samples examined, values were below the levels of detection which were 500 ppb for Cd and 0.5 ppb for Hg. Of lower toxicity, but still of concern, are copper (Cu), chromium (Cr), arsenic (As), zinc (Zn), and manganese (Mn). There seems to be no damage caused by the low levels at which these trace elements are present in produced waters (Offshore Operators Committee, 1975).

In addition to the possible toxic environmental effects of trace elements in offshore produced waters, there are some additional components and properties of produced waters which have a potential for minor environmental effects. These are salinity, dissolved oxygen, organic compounds other than hydrocarbons, and temperature.

Current treatment technology developed for each area of the country is influenced by local regulation requirements set forth by water quality, State and local laws. This technology primarily consists of oil removal prior to subsurface disposal or oil removal prior to open water discharge. The sophistication of the treatment employed is dependent upon the regulations governing such discharges. OCS Order No. 7 requires that all discharges must meet USEPA standards which allow no more than 72 mg/l daily maximum of oil and grease discharge and 48 mg/l maximum monthly average (72 mg/l is equivalent to 42 ppm). Treatment systems on offshore platforms are usually limited to meet the needs of the immediate production facility and are designed for 5,000-40,000 bbls/day. Smaller facilities may require intermediate waste storage and a transport system to deliver the produced water to another facility for treatment and disposal.

For a further discussion of these topics, see the general discussions in Sections IV.D.1.a.(2) and (3).

b. Physical Presence of Drilling Rigs, Platforms, Boats, and Barges

The exploration, development, and production of OCS resources consist of many phases of activity including the initial survey with medium to small size vessels, the placement of exploratory rigs, support from local bases utilizing crew and work boats, placement of platforms for long-term use, and the use of barges and work boats in support of production activities. All these activities affect their surroundings merely due to their presence in the area.

An increase in ship or boat traffic in an area may or may not have an impact on the area, depending on existing conditions. It is possible, however, that any increase in vessel traffic could pose additional transportation safety hazards in an area heavily traveled or particularly difficult to navigate. If existing port and supply facilities are to be used, and this is the assumption regarding activities resulting from these sales, increased usage may affect their adequacy to meet all commercial needs.

The presence of offshore rigs and platforms occasionally conflicts with commercial and sport fishing interest for space. However, this is often offset by the fish-attracting capabilities of the structures. Commercial fishing would be most affected by the presence of offshore structures. If a rig is placed in productive fishing grounds, commercial fishermen would assume the burden of safe navigation around these obstacles without entangling their gear.

All platforms and rigs are obstacles to local navigation. It is fortunate, however, that these structures are quite visible to mariners due to their size and lighting. One of the most pronounced factors regarding OCS activities is the visual impact these operations have on the surrounding area. The majority of the area offered is far offshore where structures do not interfere with the aesthetic value of the coastal areas. However, off Louisiana, blocks are being offered just beyond the 3-mile State/Federal boundary where potential OCS operations in these areas may impact the visual value of the surrounding area.

Rig and platform emplacement will result in disruption and suspension of sediments only in the immediate vicinity of the site. Displaced material or the physical presence of the rig or platform can smother burrowing and attached benthos. Increased turbidity resulting from rig and platform emplacement can temporarily clog the respiratory organs of many marine organisms and the filter-feeding mechanisms of numerous others. This increased turbidity is a short-term phenomenon, and generally is not significant beyond a few hundred meters from the site of the rig, platform, or associated anchors.

c. Pipelines

Federal offshore pipeline construction has been occurring in the Gulf of Mexico since 1951. By December 1984 the cumulative miles of OCS pipelines had reached 13,650 miles. Since 1970 annual pipeline construction has averaged about 600 miles. Data on the annual and cumulative amount of OCS pipeline construction and related landfalls is included in the Central and Western Gulf are included in Tables IV-13 and IV-14.

Offshore and onshore oil and gas pipelines are considered impact-producing factors of special concern in the marine and coastal environments on the basis of potential space/use conflicts, displacement of bottom sediments, accidental oil spills, and other environmental perturbations. The Regional Environmental Assessment of Pipeline Activities, covering the northern Gulf of Mexico region and the contiguous coastal zone, discusses regulatory procedures pertaining to pipeline installation associated with the Federal oil and gas program, describes the affected offshore and onshore environment, and discusses environmental impacts of the construction of pipelines on the OCS and nearshore region of the Gulf of Mexico (USDI, MMS, 1983e).

The Regional Technical Working Group (Volume 1, Section I.B.3.b.(8) of the Final Regional EIS) has developed a Transportation Management Plan to identify acceptable land and water areas in each leasing region for pipeline installations. MMS is currently engaged in projects to investigate the biological and ecological changes attributable to pipelines in the coastal area.

Potential Generic Impacts: The emplacement of a pipeline, by whatever technique, will always cause a certain amount of damage to the substrate. In coastal wetlands, habitat destruction and the outright elimination of the associated biota will be greatest. By placing the pipeline into marsh and/or swamp soil, marsh and swamp habitat is changed to open water or, due to the deposition of dredge spoil, to an upland habitat type. This results in a profound change in the vegetation types subsequently becoming established. Spoil banks lining pipeline canals often also seriously interfere with natural drainage patterns in coastal wetlands. If a pipeline canal remains as a straight open water body, saltwater instrusion into and accelerated dewatering of fresher marsh types occur, eliminating less saltwater tolerant vegetation. The loss of vegetation causes increasing erosion of marsh soils and ultimately, wetlands loss. Often, the pipeline emplacement methods employed will determine the severity and duration of adverse impacts on coastal habitats. Operation of heavy equipment in coastal marshes and swamps can be very destructive to these habitat types and their biota for many years.

The destruction of coastal wetlands habitat manifests itself in reduced commercial fisheries catches. Exact figures are lacking but coastal biologists and ecologists generally agree that there exists a relationship between coastal wetlands loss and a reduction in commercial fisheries landings.

Emplacement of pipelines in shallow bays, estuaries, nearshore areas, and in soft-bottom offshore areas will usually suspend much bottom sediment and organic matter, and with it, possibly nutrients, toxic heavy metals, and pesticides. These substances are then often re-introduced into the food chain. The attendant increase in turbidity is, although temporary, also detrimental to fish larvae and acquatic invertebrates because of clogging of gills and feeding structures. Displaced material from pipeline trenches will smother and/or displace sessile benthos.

Table IV-13

Annual Construction of OCS Related Offshore Pipeline and Pipeline Landfalls: Central Analysis Area

Year	Federal OCS[1]		State Offshore[2]		Landfalls (Reported)[3]											Estimated Landfalls Constructed[4]
					Oil		Gas		Condensate		Gas/Oil		Currently Abandoned			
	Segments	Miles	Segments	Miles	Major	Minor	Major	Minor	Major	Minor	Major	Minor	Major	Minor	Total	
1951	-	-	1	.9	-	-	-	-	-	-	-	-	-	-	-	-
1952	1	10.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1953	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1954	1	.9	3	6.9	-	1	-	-	-	-	-	-	-	-	1	1
1955	5	8.6	-	-	-	-	-	-	-	-	-	-	-	-	-	2
1956	13	55.1	3	14.8	-	-	1	-	-	-	-	-	-	-	1	2
1957	8	8.5	2	6.9	-	-	-	-	-	-	-	1	-	-	1	1
1958	15	20.8	2	4.9	-	-	-	1	-	-	-	-	-	-	1	2
1959	8	28.4	3	4.6	-	-	-	1	-	-	-	-	-	-	1	1
1960	19	29.6	6	21.9	-	-	-	2	-	1	1	-	-	-	4	2
1961	20	58.8	7	28.5	-	-	1	5	-	-	-	-	-	-	6	5
1962	27	98.8	1	4.2	-	-	1	-	-	-	-	-	-	-	1	1
1963	39	126.7	11	42.8	-	1	2	4	-	-	-	-	1	-	8	9
1964	18	65.1	2	74.3	-	-	-	2	-	-	-	-	-	-	2	1
1965	24	63.6	3	14.9	-	-	-	2	-	-	1	-	-	-	3	3
1966	31	271.7	5	21.2	1	-	-	3	-	-	1	-	-	-	5	6
1967	36	200.4	7	34.7	-	-	2	1	-	-	-	-	1	-	4	8
1968	39	227.9	9	46.6	1	-	2	1	-	-	3	-	-	-	7	6
1969	82	415.7	9	49.6	2	1	1	2	-	1	-	-	-	-	7	9
1970	125	413.2	9	43.2	2	1	3	1	-	-	1	-	-	-	8	8
1971	208	393.2	3	17.7	1	1	-	-	-	-	-	1	-	-	3	3
1972	318	1,286.3	15	158.7	-	-	6	3	-	-	-	1	-	-	10	10
1973	103	376.5	3	10.6	-	-	2	-	-	-	1	-	-	-	3	4
1974	115	522.8	4	31.5	-	-	2	-	-	-	1	-	-	-	3	3
1975	129	387.1	1	4.1	-	-	-	1	-	-	-	-	-	-	1	6
1976	200	578.9	5	24.5	1	-	-	-	-	-	1	1	-	-	3	5
1977	133	356.0	3	22.5	-	-	1	-	-	-	-	1	-	-	2	2
1978	202	585.4	9	40.4	-	1	2	4	-	-	1	-	-	-	8	13
1979	204	586.3	2	17.3	-	-	2	-	-	-	-	-	-	-	2	3
1980	178	649.7	3	4.9	-	-	-	1	-	-	-	-	-	-	1	4
1981	197	546.0	-	-	-	-	-	-	-	-	-	-	-	-	-	6
1982	147	261.6	-	-	-	-	-	-	-	-	-	-	-	-	-	5
1983	201	465.2	-	-	-	-	-	-	-	-	-	-	-	-	-	1
1984[5]	176	265.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OTHER[6]	2,829	3,098.0	50	251.0	7	-	1	3	-	1	7	7	3	3	32	7
TOTAL[7]	5,704	12,201.1	181	1,004.1	15	6	29	37	-	3	18	12	5	3	128	139

[1] Federally permitted.
[2] State permitted pipelines originating in Federal OCS waters.
[3] Number of pipelines originating in Federal OCS waters with onshore routing. Major transmission lines are generally greater than or equal to 10" for oil, and greater than or equal to 20" for gas. For condensate, gas/oil, and abandoned lines, major lines are greater than or equal to 10".
[4] Information on estimated landfalls was obtained from an extensive review of data from industry, State, and Federal sources.
[5] As of December 1984.
[6] No construction date available.
[7] For pipeline construction in State waters, information has not been reported since 1980.

Note: This table represents constructed pipelines. Additional pipelines that have been permitted but not constructed are excluded from the data.

Source: USDI, MMS, 1984c.

Table IV-14

Annual Construction of OCS-Related Offshore Pipeline and Pipeline Landfalls: Western Analysis Area

Year	Federal OCS[1]		State Offshore[2]		Landfalls (Reported)[3]											Estimated Landfalls Constructed[4]
					Oil		Gas		Condensate		Gas/Oil		Currently Abandoned			
	Segments	Miles	Segments	Miles	Major	Minor	Major	Minor	Major	Minor	Major	Minor	Major	Minor	Total	
1951	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1952	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1953	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1954	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1955	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1956	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1957	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1958	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1959	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1960	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1961	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1962	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1963	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1964	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1965	2	22.6	1	15.0	-	-	-	-	-	-	1	-	-	-	1	1
1966	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1967	1	22.1	1	15.1	-	-	-	1	-	-	-	-	-	-	1	1
1968	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1969	4	4.0	-	-	-	-	-	-	-	-	-	-	-	-	-	1
1970	1	16.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1971	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1972	10	26.0	1	7.4	-	-	-	-	-	-	-	-	-	-	-	-
1973	4	50.1	1	10.5	-	-	1	-	-	-	-	-	-	-	1	1
1974	2	11.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1975	2	.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1976	3	2.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1977	2	19.6	1	1.7	-	-	-	-	-	-	-	-	-	-	-	1
1978	24	148.8	1	22.0	1	-	-	-	-	-	-	-	-	-	1	2
1979	21	209.4	-	-	-	-	-	-	-	-	-	-	-	-	-	1
1980	38	224.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	333	58.9	-	-	-	-	-	-	-	-	-	-	-	-	-	3
1982	13	29.9	-	-	-	-	-	-	-	-	-	-	-	-	-	1
1983	26	91.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1984[5]	5	23.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OTHER[6]	117	416.8	4	48.3	-	-	1	1	-	-	-	1	-	-	3	1
TOTAL[7]	292	1,448.4	10	120.0	1	-	2	2	-	-	1	1	-	-	7	13

[1] Federally permitted.

[2] State permitted pipelines originating in Federal OCS waters.

[3] Number of pipelines originating in Federal OCS waters with onshore routing. Major transmission lines are generally greater than or equal to 10" for oil, and greater than or equal to 20" for gas. For condensate, gas/oil, and abandoned lines, major lines are greater than or equal to 10".

[4] Information on estimated landfalls was obtained from an extensive review of data from industry, State, and Federal sources.

[5] As of December 1984.

[6] No construction date available.

[7] For pipeline construction in State waters, information has not been reported since 1980.

Note: This table represents constructed pipelines. Additional pipelines that have been permitted but not constructed are excluded from the data. There is no reported or estimated OCS pipeline construction prior to 1965.

Source: USDI, MMS, 1984c.

Recolonization of the disturbed areas depends on the types of organisms present and the kinds of substrates involved.

On hard bottom areas, emplacing a pipeline, by whatever technique, will eliminate the suitable sites for attachment of those organisms dependent on a firm substrate for attachment (sponges, corals, seaweeds, and sessile molluscs). Recolonization of an area disturbed by pipeline burial will depend on the species present and the time required for the substrate to compact to an acceptable degree.

In coastal wetlands, the severity of adverse effects of the presence of a pipeline depends on whether the pipeline is buried or whether an open canal has resulted from pipeline emplacement. In a marsh habitat, if a pipeline is carefully covered after burial and if the covering material is at the elevation of the surrounding marsh, revegetation by marsh species will occur and impacts will be minimal. If an open canal remains after burying the pipeline, saltwater intrusion and marsh soil erosion will adversely impact coastal wetlands. Open canals, however, sometimes provide excellent sport fishing.

In offshore waters, some gear conflict between commercial trawls and pipelines does exist. Adverse impacts are small, however. Further, buried pipelines often cause a slight elevation on the Gulf floor and attract fish and shellfish. This fact is recognized by some commercial fishermen, and pipelines in offshore waters are preferred fishing areas.

Oil spills that occur in coastal wetlands as a result of a leak or rupture in a pipeline usually cause severe and often long-term adverse impacts. Marsh vegetation, especially mangroves, are extremely sensitive to oil spills; subsequent cleanup operations are difficult, if not impossible, to conduct without causing additional damage to the vegetation. Recovery of coastal wetlands from an oil spill may range from several months to many years, depending on the severity of the spill and the vegetation involved.

A small acute or chronic oil spill in offshore waters from a pipeline would probably have very little impact on the commercial fishing industry, although an unknown number of fish and shellfish eggs and larvae could be destroyed. In shallow bays and estuaries that constitute nursery areas for many commercially important fish and shellfish species, an oil spill would be much more detrimental because larvae and juveniles of these species are more sensitive to spilled oil than adults.

Hazards Management: Offshore pipelines are exposed to numerous hazards including corrosion, geologic hazards, hydrodynamic forces, and accidental damage caused by anchors or other objects. Pipeline corrosion can be internal or external and may result in leaks and/or breaks. Geologic hazards capable of causing pipeline failure are sediment instability and seismic activity. Delta areas (Mississippi and Atchafalaya Deltas) are considered particularly hazardous because of sediment instability. Sediment failure resulting from seismic activity, too, can place hazardous stresses on pipelines. To minimize the potential for pipeline failure resulting from such hazards, the information obtained during a preconstruction route survey is analyzed to determine the safest and most stable route for pipeline placement. Areas with active faults and mudfloor potential should be avoided or design measures should be implemented to reduce the potential risk of pipeline failures.

Hydrodynamic forces may remove sediment from around a pipeline and cause stresses from sagging and vibration if waterflow velocity is sufficiently high. Anchors, fishnets, or any other objects that may be dragged across or dropped upon a pipeline can also cause damage and possible leakage. Of 534 recorded pipeline leaks from 1967 to 1981, 61 were directly attributed to anchoring. To help alleviate this problem, pipelines are required to cross perpendicular to fairways and to be buried 10 feet below the bottom or as stipulated by COE. Pipelines in anchorage areas are generally required to be buried at least 16½ feet. Under normal circumstances vessels do not anchor in fairways on the OCS, so conflict is unlikely. However, when a vessel nears its destination it is fairly common practice to reduce speed by dragging anchor. Obviously, this can be a potential problem if there are pipelines in the area.

Starting in July 1980, installation requirements were revised by BLM (and now by MMS) for pipelines installed on the Federal OCS in order to mitigate incidents of pipeline failure resulting from the hazards discussed above. For a more detailed description of hazards, see

Volume 1, Section IV.C.2.b. of the Final Regional EIS and Section III.A.1.b. of the Regional Environmental Assessment of Pipeline Activities.

In addition to the controls in Sections I.B.3.b.(1)(d) and I.B.4.b., conditions may be attached to permits for rights-of-way should particular concern be warranted. Further, other statements of fact that must accompany Federal permits for OCS pipelines are a certification that the action is consistent with the approved Coastal Zone Management Program of the affected state, and diver verification that the holder has satisfied all permit requirements of the regulations. Additional agencies and a more detailed description of these Federal regulations may be seen in Volume 1, Section IV.C.2.c. of the Final Regional EIS and Sections I.C. and II.C. of the Regional Environmental Assessment of Pipeline Activities.

5. Oil Spill Contact Assumptions

The term spill contact as used in this discussion, the referenced tables, and throughout the analyses (e.g., the assumed number of spill contacts and the percent chance of one or more spill contacts) means an oil spill occurring and contacting a land segment or other target.

a. Federal OCS Activity

Oil spill contact assumptions for large (1,000 bbls or greater), medium (50-999 bbls), and small (1-49 bbls) spills resulting from Federal OCS activity are presented in a number of tables.

Table IV-15 lists the total assumed number of large, medium, and small spill contacts with coastal land segments (within 10 days for large and medium spills and within 3 days for small spills) under each scenario for each proposed action. These assumptions are based on the historic spill rates discussed in Section IV.B. and the OSRA estimates of the probability of spill contacts and mean number of spill contacts (for large spills) under the M, L, H, Cumulative, and T Scenarios.

Table IV-15

Oil Spill Contact Assumptions with Land Segments: Federal OCS Activity

	Assumed Number of Contacts		
	1-49 bbls	50-999 bbls	≥ 1,000 bbls
Central Planning Area			
Proposed Action			
M Scenario	15	1	1
L Scenario	6	1	1
H Scenario	30	2	1
Cumulative Scenario	290	18	7[1]
T Scenario	154	11	2
Western Planning Area			
Proposed Action			
M Scenario	13	1	1
L Scenario	4	1	1
H Scenario	16	2	1
Cumulative Scenario	136	11	4[1]
T Scenario	82	7	2

[1] Includes spill contacts with the potentially affected coastal area resulting from both proposed actions (Sales 104 and 105) under the M Scenario, existing leases in the Gulf of Mexico, and crude oil imports by tankers in the Gulf of Mexico. For additional information, see footnotes 10 and 11 to Table IV-8.

Source: USDI, Minerals Management Service, Gulf of Mexico OCS Region estimates.

The assumed cumulative number of spill contacts listed in the tables is for a potentially affected coastal area which was delineated to include (but not necessarily be limited to) all land segments with a reasonably foreseeable chance (1% or greater) of being contacted by a spill resulting from oil/gas development in the planning area. The cumulative numbers reflect the sum of the spill contacts with the potentially affected coastal area resulting from both proposed actions (under the M Scenarios), existing leases in the Gulf, and crude oil imports by tanker in the Gulf.

The assumed number of large spill (1,000 bbls or greater) contacts with land segments (total and specific land segments) and selected targets are listed in Table IV-16 for the M, H, Cumulative (not including spills related to State offshore oil/gas activity), and T Scenarios. These spill contacts are not a direct result of the OSRA (Section IV.B.), but have been derived on the basis of the OSRA estimates of the probability (percent chance) of one or more contacts and the mean number of spill contacts (Tables IV-19 and IV-20). The assumed number of spill contacts shown in Table IV-16 was derived as follows: one spill contact is assumed for each land segment and target that the OSRA estimates has a 1% or greater chance of one or more spill contacts and a mean number of spill contacts of 1.0 or less; thereafter, the assumed number is derived by rounding the mean number up to the next whole number.

This method of derivation is further illustrated in the following table:

Derivation of Assumed Number of
Spill Contacts

	OSRA Estimates	
Assumed Number of Spill Contacts	Probability[1] (% chance)	Mean[2] Number
1	1% or greater	1.0 or less
2	1% or greater	1.1 - 2.0
3	1% or greater	2.1 - 3.0
4	1% or greater	3.1 - 4.0
5	1% or greater	4.1 - 5.0
etc.	1% or greater	etc.

[1] Percent chance of one or more oil spills occurring and contacting a land segment or target within 10 days.

[2] Mean number of oil spills occurring and contacting a land segment or target within 10 days.

This procedure allows for the analysis of at least one spill contact with all land segments and targets which have a reasonably foreseeable chance (defined as 1% or greater) of being contacted (based on the OSRA discussed in Section IV.B.), even though in many instances such an occurrence would be very unlikely.

It is noted that the assumed number of spill contacts with specific land segments listed in Table IV-16 are not additive. For example, the assumed number of spill contacts with total land segments for Central Gulf Sale 104 (M Scenario) is listed as one, however one assumed spill contact is also listed for each of eight land segments. The same is true for the other scenarios (including those for Western Gulf Sale 105): the sum of the assumed spill contacts for specific land segments is always considerably greater than the number listed for total land segments due to the method of derivation. This situation is to be interpreted as follows (using the above example): a total of one spill contact is assumed with coastal land segments as a result of Central Gulf Sale 104; this spill contact has a reasonably foreseeable chance to occur with any one of eight land segments; therefore, the impact of one assumed spill contact on the vulnerable resources of concern located in each of the eight land segments is considered in the analysis.

Table IV-16

Assumed Number of Large Oil Spill (≥ 1,000 bbls) Contacts with Land Segments and Selected Targets Within 10 Days of Occurrence:
Central Gulf Sale 104 and Western Gulf Sale 105 Scenarios

Land Segments/Targets	CENTRAL GULF SALE 104 Scenarios								WESTERN GULF SALE 105 Scenarios							
	M		H		T		Cumulative		M		H		T		Cumulative	
	AN	PC	AN	PC	AN	PC	AN	PC	AN	PC	AN	PC	AN	PC	AN	PC
Total Land Segments	1	18	1	30	2	86	7	**	1	13	1	21	2	67	4	98
1 Cameron, TX	-		-		-		-		0	n	0	n	1	7	1	2
2 Willacy, TX	-		-		-		-		0	n	0	n	1	2	1	2
3 Kenedy, TX	-		-		-		-		0	n	0	n	1	6	1	15
4 Kleberg, TX	-		-		-		-		0	n	1	1	1	7	1	10
5 Nueces, TX	-		-		-		-		1	1	1	1	1	14	1	13
6 Aransas, TX	-		-		-		-		0	n	0	n	1	2	1	4
7 Calhoun, TX	-		-		-		-		0	n	1	1	1	2	1	4
8 Matagorda, TX	-		-		-		-		1	2	1	3	1	7	1	9
9 Brazoria, TX	-		-		-		-		1	3	1	5	1	13	1	18
10 Galveston/Chambers, TX	0	n	0	n	1	1	1	41	1	7	1	12	1	33	1	41
11 Jefferson, TX	0	n	0	n	1	2	1	16	0	n	0	n	1	1	1	16
12 Cameron, LA	1	2	1	3	1	15	1	41	0	n	0	n	0	n	1	41
13 Vermilion, LA	1	3	1	5	1	20	1	41	0	n	0	n	0	n	1	41
14 Iberia, LA	1	2	1	3	1	15	1	30	0	n	0	n	1	1	1	30
15 St. Mary, LA	0	n	0	n	1	1	1	3	0	n	0	n	0	n	1	3
16 Terrebonne, LA	1	5	1	9	1	38	1	65	0	n	0	n	1	2	1	65
17 Lafourche, LA	1	2	1	3	1	11	1	44	-		-		-		-	
18 Jefferson, LA	1	1	1	2	1	8	1	44	-		-		-		-	
19 Plaquemines, LA	1	3	1	5	1	36	2	76	-		-		-		-	
20 St. Bernard/Orleans/ St. Tammany, LA	1	2	1	3	1	17	1	40	-		-		-		-	
21 Hancock/Harrison/ Jackson, MS	0	n	0	n	1	1	1	8	-		-		-		-	
22 Mobile, AL	0	n	0	n	1	1	1	4	-		-		-		-	
23 Baldwin, AL	0	n	0	n	0	n	1	4	-		-		-		-	

Table IV-16. Assumed Number of Large Oil Spill (≥ 1,000 bbls) Contacts with Land Segments and Selected Targets Within 10 Days of Occurrence: Central Gulf Sale 104 and Western Gulf Sale 105 (continued)

	CENTRAL GULF SALE 104 Scenarios								WESTERN GULF SALE 105 Scenarios							
	M		H		T		Cumulative		M		H		T		Cumulative	
Land Segments/Targets	AN	PC	AN	PC	AN	PC	AN	PC	AN	PC	AN	PC	AN	PC	AN	PC
Land	1	18	1	30	2	86	*		1	13	1	21	2	67	*	
Archaeological Sites	1	1	1	2	1	12	*		1	5	1	9	1	28	*	
Brown Pelican Habitats	1	4	1	8	1	29	*		1	2	1	4	1	23	*	
Sea Turtle Nesting	-		-		-		-		1	1	1	2	1	35	*	
TX Recr. Beaches	-		-		-		-		1	10	1	18	1	57	2	66
LA Recr. Beaches	1	3	1	5	1	22	2	74	0	n	0	n	0	n	*	
MS Recr. Beaches	0	n	0	n	1	1	1	9	-		-		-		-	
AL Recr. Beaches	0	n	0	n	1	1	1	5	-		-		-		-	
Gulf Recreational Beaches	1	3	1	5	1	23	*		1	10	1	18	1	57	*	
Flower Garden Banks	0	n	0	n	1	1	1	11	1	1	1	1	1	6	1	11
Gulf Seagrass Beds	1	9	1	16	1	58	*		1	8	1	13	1	36	*	
Vermilion/Atch. Bays	1	3	1	5	1	21	1	40	0	n	0	n	1	1	1	40
Timbalier Bay	1	1	1	2	1	8	1	29	-		-		-		-	
Barataria Bay	1	1	1	2	1	9	1	49	-		-		-		-	
Breton/Chand. Sounds	0	n	0	n	1	2	1	5	-		-		-		-	
TX Endangered Species	-		-		-		-		1	6	1	10	1	47	1	56
LA Endangered Species	1	7	1	12	1	56	4	96	-		-		-		-	
MS Endangered Species	0	n	0	n	1	1	1	8	-		-		-		-	
Gulf Endangered Species	1	7	1	13	1	57	*		1	6	1	10	1	47	*	
Padre Island N.S.	-		-		-		-		1	1	1	1	1	14	1	23
Gulf Island N.S.	0	n	0	n	1	2	1	11	-		-		-		-	
LA Mangroves	1	8	1	15	1	54	3	88	0	n	0	n	1	2	*	
Gulf Mangroves	1	8	1	15	1	54	*		0	n	0	n	1	2	*	
TX Marshes	0	n	0	n	1	3	1	63	1	11	1	19	1	46	1	63
LA Marshes	1	17	1	29	2	84	6	**	0	n	0	n	1	4	6	**
MS Marshes	0	n	0	n	1	1	1	8	-		-		-		-	
AL Marshes	0	n	0	n	1	1	1	6	-		-		-		-	
Gulf Marshes	1	18	1	30	2	85	*		1	11	1	19	1	48	7	**
TX Seagrass Beds	0	n	0	n	1	1	1	41	1	7	1	12	1	33	1	41
LA Seagrass Beds	1	9	1	15	1	54	3	88	0	n	0	n	1	3	3	88
MS Seagrass Beds	0	n	0	n	1	1	1	8	-		-		-		-	
AL Seagrass Beds	0	n	0	n	1	1	1	4	-		-		-		-	
Galveston Bay	0	n	0	n	1	1	1	41	1	7	1	12	1	33	1	41
Mobile Bay	0	n	0	n	1	1	1	6	-		-		-		-	

Source: Anderson et al., 1985.
USDI, Minerals Management Service, Gulf of Mexico OCS Region estimates.

Table IV-16. Assumed Number of Large Oil Spill ($\geq$ 1,000 bbls) Contacts with Land Segments and Selected Targets Within 10 Days of Occurrence: Central Gulf Sale 104 and Western Gulf Sale 105 Scenarios (continued)

Notes:

1. The term spill contact as used in this table and throughout the analyses (e.g. the assumed numbers of spill contacts; the percent chance of one or more spill contacts) means an oil spill occuring and contacting a land segment or other targets. When used in reference to offshore targets the term contact refers only to an oil spill occurrence and contact with a target as delineated on the water surface; such a surface contact does not necessarily entail the actual physical contact between the oil spill constituents and resources located below the water surface.

2. AN = the assumed number of spill contacts; PC = the percent chance of one or more spill contacts (Note 4).

3. The assumed number of spill contacts are not a direct result of the OSRA discussed in Section IV.B.2. These numbers have been derived for analysis on the basis of the OSRA estimates of the probability (percent chance) of spill contacts and the mean numbers of spill contacts listed in Tables IV-19 and IV-20. Section IV.A.5. discusses the method used to derive the assumed number of spill contacts listed in this table.

4. The probability (expressed as percent chance) of one or more spills occurring and contacting (PC) is as estimated by the OSRA (Section IV.B., Tables IV-19 and IV-20). An n indicates less than 0.5%; ** indicates greater than 99.5%.

5. A dash (-) indicates a land segment or a target wholly outside of the potentially affected coastal areas delineated to include all land segments with a reasonably foreseeable chance (1% or greater) of being contacted by a spill resulting from oil and gas development in the planning area. Land segments not listed are considered outside the potentially affected coastal areas for both proposed actions (planning areas).

6. The assumed numbers of spill contacts for the cumulative scenario are for a potentially affected coastal area delineated to include (but is not necessarily limited to) all land segments with a reasonably foreseeable chance (1% or greater) of being contacted by a spill resulting from oil and gas development in the planning area. The potentially affected coastal area for the spill contacts resulting from oil and gas development in the CPA is comprised of land segment 10 (Galveston/Chambers Counties, Texas) through 23 (Baldwin County, Alabama); similarly, the potentially affected coastal area for the WPA is comprised of land segment 1 (Cameron County, Texas) through 16 (Terrebonne Parish, Louisiana). The cumulative scenario numbers include spill contacts resulting from both proposed actions (M Scenarios), existing leases in Federal offshore waters, and crude oil imports by tanker in the Gulf of Mexico. An * indicates that the OSRA did not provide data on the number of spill contacts with the portion of the target located within the potentially affected coastal area.

7. The assumed number of spill contacts listed in this table are not additive. For example, the total number of assumed spill contacts with land segments is listed opposite the item "Total Land Segments" for each scenario; this total, or any subtotal, can not be derived by adding the assumed numbers for the component land segments.

b. State Offshore Oil and Gas Activity

Oil spill contact assumptions have been derived for State offshore activity for use in the analyses of cumulative impacts. The total assumed number of large (1,000 bbls or greater), medium (50-999 bbls), and small (1-49 bbls) spill contacts with land segments within 10 days for the large and medium spills and within 3 days for the small spills are listed in Table IV-8. The assumed number of spill contacts listed in the table is for a potentially affected coastal area which was delineated to include all land segments with a reasonably foreseeable chance (1% or greater) of being contacted by a spill resulting from oil/gas development in the planning area. The number of assumed spill contacts was derived on the basis of rough estimates of the number of spill occurrences that could result from a continuation of oil production in State offshore waters over the period 1986-2005. Large spills resulting from State offshore activity were not included in the OSRA because information on the amount and general location of oil resources in State waters is unavailable and because of unresolved technical problems related to simulating oil spill trajectories in these areas.

c. Cumulative Oil Spill Assumptions

The assumed cumulative number of large (1,000 bbls or greater), medium (50-999 bbls) and small (1-49 bbls) contacts with land segments for each proposed action is listed in Table IV-8. The assumed number of spill contacts is for a potentially affected coastal area delineated to include (but are not necessarily limited to) all land segments with a reasonably foreseeable chance (defined as 1% or greater) of being contacted by a spill resulting from oil/gas development in the planning area. The potentially affected coastal area for the spill contacts resulting from oil/gas development in the CPA is comprised of land segments 10 (Galveston/Chambers Counties, Texas) through 23 (Baldwin County, Alabama); similarly, the potentially affected coastal area for the WPA is comprised of land segments 1 (Cameron County, Texas) through 16 (Terrebonne Parish, Louisiana). The total cumulative numbers reflect the sum of spill contacts with the potentially affected coastal area resulting from both proposed actions (Central Gulf Sale 104 and Western Gulf Sale 105 under their M Scenarios), existing leases in the Gulf of Mexico, crude oil imports by tanker in the Gulf, and continued oil production in State offshore waters over the period 1986-2005.

B. OIL SPILLS

1. Historic Spill Rates

Accidental discharge of oil can occur during almost any stage of exploration, development, or production on the OCS. Oil spills occur as a result of many causes, i.e., equipment malfunctions, pipeline breaks, human error, severe storms, etc. Although many oil spills are not directly attributable to the oil extraction process, they are indirectly related through the support activities necessary to recovery and transmission of the resource. Section IV.B.1. of the Final Regional EIS shows that production activity is the major cause of OCS-related oil spills.

The size of an oil spill can vary greatly from less than one barrel to hundreds of thousands of barrels being released over a period of time as a result of a single event. It is not currently known if there is a direct relationship between the size of an oil spill and the event responsible for it. Therefore, the number of oil spills that could occur as a result of the proposals will be shown by size class, rather than source.

Section IV.B.1. and Table IV-15 of the Final Regional EIS show the annual number of oil spills on the Federal OCS for various size categories for the years 1964-1981. Using this and the updated information for 1982 and 1983, the following spill rates were calculated for spill sizes less than 1,000 bbls relative to production rate.

Spill Size	Spill Rate (spills/billion bbls produced)
1-49 bbls	379
50-999 bbls	13

The above spill rates are rounded up to the nearest whole number. Also note that the spill rate for spills less than 1 bbl are not shown due to limitations in the data base.

The 1,000 bbl cutoff between large and small spills was selected primarily for two reasons. First, the smaller spills may occur unnoticed offshore and thus not be included in historic data bases, and second, the large (1,000 bbls and greater) spills projected will be modeled in the Oil Spill Risk Analysis (OSRA) which requires as input, spills large enough to travel great distances or remain intact for up to 30 days time. For these reasons, a slightly different format is used for the spill rates of large spills. Historic spill rates for oil spills greater than or equal to 1,000 bbls on the Federal OCS used in the OSRA (Anderson et al., 1985) as taken from Lanfear and Amstutz (1982) and Nakassis (1982) are as follows:

	Spill Rates 1,000 bbls or greater/billion bbls produced and transported
Platforms	1.0
Pipelines	1.6
Tankers	1.3 (at sea 0.9/in port 0.4)

2. Estimated Mean Number of Spills

The mean spill rates shown in Section IV.B.1. above are applied to the estimated volumes of oil expected to be produced and transported, according to each scenario, in order to project the appropriate mean number of spills estimated to occur from these scenarios. This is accomplished by multiplying the volume of oil against the spill rates. For example, the estimated volume of oil for the M Scenario in the Central Gulf is 0.15 billion bbls; the projected number of spills between 1 and 50 bbls, were calculated by multiplying this volume by 379. For analysis purposes, only whole numbers of spills are discussed so the result is rounded up to the next highest whole value or 57. The following table shows the assumed mean number of small spills for each scenario under the proposed actions.

Assumed Number of Small Spill Occurrences

	Volume of Oil (billion bbls)	1-49 bbls	50-999 bbls
CENTRAL			
M Scenario	0.15	57	2
H Scenario	0.27	103	4
T Scenario	2.44	925	32
WESTERN			
M Scenario	0.10	38	2
H Scenario	0.18	69	3
T Scenario	1.65	626	22
EXISTING	4.35	1,649	57
CUMULATIVE	4.60	1,744	60

The existing resources above includes all discovered oil considered to occur under all existing leases Gulfwide at the time of the proposed sales. The cumulative value includes the M Scenario resources for both of the proposed sales as well as the resources on existing leases.

The projected mean numbers of large spills (equal to or greater than 1,000 bbls) are derived in the same manner as the small spills above but, because of the different format of the spill rates and resource breakdowns, the assumed number of spills are presently in a slightly different form. The transportation values, for example, include both spills from pipelines and tankering of OCS products. The assumed number of spills presented in the following table result from rounding up the spill values presented in Table IV-17, as provided by the Branch of Environmental Modeling, MMS, Reston (Anderson et al., 1985).

Assumed Number of Large Spill Occurrences

	Volume of Oil (billion bbls)	Spills from Platforms	Spills from Transportation	Total
CENTRAL				
M Scenario	0.15	1	1	1
H Scenario	0.27	1	1	1
T Scenario	2.44	3	4	7
WESTERN				
M Scenario	0.10	1	1	1
H Scenario	0.18	1	1	1
T Scenario	1.65	2	3	4
EXISTING	4.35	5	7	12
TANKERING OF IMPORTS	21.55	-	10	10
CUMULATIVE	26.15	-	-	22

The existing resources above include all discovered oil considered to occur under all existing leases Gulfwide at the time of the proposed sales. The cumulative value is a combination of the M Scenarios for both the Central and Western Gulf, the existing values and the tankering of imports. OSRA combines these estimated spills with the results of Gulfwide oil spill trajectory simulations to give the mean number and probabilities of oil spills to occur and contact specified land segments and special targets.

3. Trajectory Simulation

Oil spill trajectory simulations were conducted using seasonal surface currents coupled with wind data, adjusted every three hours for 30 days or until a target is contacted. Hypothetical spill trajectories were simulated for each of the potential launch sites (Visual No. 12) across the entire Gulf. The Eastenr Gulf was included, even though there is no proposed action, because of the existing leases and tanker routes which are included in the cumulative analysis. These simulations presume 500 spills occurring in each of the four seasons of the year. The results are presented as probabilities (expressed as percent chance) that an oil spill starting at a particular launch site will contact a certain land segment (Visual No. 12) within 3, 10, or 30 days. A summary of the trajectory analysis (for 10 days) for all launch sites across the Gulf presenting a potential risk to the land segments is given in Table IV-18. This table illustrates that if an oil spill were to occur in the Western Gulf, the probability (expressed as percent chance) of contact with a certain land segment within 10 days from less than 0.5% to about 65%. The corresponding counties for the highest percent chance of contact are Matagorda County in Texas and Plaquemines Parish in Louisiana.

Table IV-17

Oil Spill Probability Estimates for Spills Greater than 1,000 Barrels by Point of Origin for Each Assumed Volume of Oil Occurring over the Lease Lifetime

Source	Assumed amount of oil (Bbl)	Mean number of spills from platforms	Mean number of spills from transportation	Mean number of spills (total)	Probability of one or more spills (platforms)	Probability of one or more spills (transportation)	Probability of one or more spills (total)
Most Likely Find Scenario							
Western Gulf	0.10	0.10	0.15	0.25	0.10	0.14	0.22
Central Gulf	0.15	0.15	0.24	0.39	0.14	0.21	0.32
Western and Central	0.25	0.25	0.39	0.64	0.22	0.32	0.47
High Find Scenario							
Western Gulf	0.18	0.18	0.27	0.45	0.16	0.24	0.36
Central Gulf	0.27	0.27	0.43	0.70	0.24	0.35	0.50
Western and Central	0.45	0.45	0.70	1.15	0.36	0.50	0.68
Total Find Scenario							
Western Gulf	1.65	1.65	2.21	3.86	0.81	0.89	0.98
Central Gulf	2.44	2.44	3.57	6.01	0.91	0.97	0.99+
Western and Central	4.09	4.09	5.79	9.88	0.98	0.99+	0.99+
Existing Leases	4.35	4.35	6.97	11.32	0.99	0.99+	0.99+
Tankering of Crude Oil Imports: Over 18 years	21.55	-	9.70	9.70	-	0.99+	0.99+

Source: Anderson et al., 1985.

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Table IV-18

Trajectory Simulation[1]

Probabilities (expressed as percent chance) that an Oil Spill Starting at a Particular Location will Contact a Certain Land Area Within 10 Days

Hypothetical Spill Location

Land Segment	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W14	W15	W16	W17	W21	W22	W23	W24
1	35	3	1	18	5			2											
2	18	6	1	9	5			1	1										
3	27	60	13	16	29	3	1	2	2										
4	2	24	24	2	21	5	1	1	1										
5		3	38		11	12	5	2	8										
6			16		2	19	17	1	12	2		2	1						
7			2		1	24	53		10	16	5	4	7	1					
8						4	15		1	46	71	1	8	23	10	1	1		
9											7			16	32		6	5	2
10														2	37		7	49	43
11																		5	39
12																			1

Hypothetical Spill Location

Land Segment	W29	W30	C31	C32	C33	C38	C39	C40	C41	C42	C47	C48	C49
10	3	20	1	5	4								
11	1	14	1	18	18		1	2					
12		1	1	20	63	1	23	62	13	10		1	1
13							1	9	19	61	1	8	13
14									1	4	1	6	20
15											n	1	2
16											2	10	23

Hypothetical Spill Location

Land Segment	C53	C54	C55	C56	C59	C60	C61	C62	C63	C64	C67	C68	C69	C70	C71	C72	C73	C74	C75
16	1	15	40	29			2	4	1										
17		4	12	39		2	8	23	13	1									
18				14			4	20	41	4									
19					2	8	19	14	30	65	1	5	7	18	20	4	1	1	2
20										2			1	11	43	32		4	11
21															1	8		3	17
22																1		4	7

Hypothetical Spill Location

Land Segment	C76	C77	E84	E85	E86	E93	E94	E95
19	1							
20	5	6						
21	21	35		1				
22	25	39	3	10	6			
23	3	9	3	21	36		1	1
24			2	13	34	1	14	22
25						1	11	30
26							4	12
27							1	2

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Table IV-18. Trajectory Simulation[1,2] (continued)

Hypothetical Spill Location

Land Segment	E 105	E 106	E 116	E 117	E 118
25		3			
26	1	10			
27	3	17			
28	5	3		3	
29	4	1	3	36	61
30				1	20

Hypothetical Spill Location

Land Segment	E 126	E 127	E 128	E 129	E 130	E 137	E 138	E 140	E 146	E 150	E 151
29			1	12	19						
30				7	43						
31				1	8						
32				1				1			
33								4			
37							2				
38						1			1		
39						1			2		
41										1	9
42										1	1

[1] Columns and rows with values less than 0.5% are not shown.

Source: Anderson et al., 1985.

Note: Refer to Visual No. 12 for a description of land segments and hypothetical spill areas when using this table.

4. Estimated Number of Contacts from Projected Mean Number of Oil Spill Occurrences

The final phase of the OSRA combines the projected mean number of spill occurrences with the probabilities of contact provided by the trajectory analyses. The results are given in a series of tables presenting two values for each land segment and special target across the Gulf, in each of three time frames; 3, 10, and 30 days. The two values represent the probability of one or more spills to occur and contact the target, and the estimated mean number of spills that might occur and contact the target. Tables IV-19 and IV-20 are a subset of these tables which include all land segments within the potentially affected coastal areas delineated for each proposed action (Section IV.A.5.a.), and the targets with a discernible risk of contact by a spill resulting from the development of the total undiscovered, economically recoverable oil in the respective planning areas. The cumulative values in Tables IV-19 and IV-20 represent the risk presented by the estimated resources of the M Scenarios for both proposed actions, tankering of imports in the Gulf and all production and transportation activities resulting from leasing prior to the proposed action. Because the OSRA represents all existing leasing and all import tankering with single, Gulfwide values, these cumulative values must also be considered Gulfwide.

Section IV.A.5. states the assumptions made regarding the values in Table IV-19 and IV-20, which will allow the analytical discussions in Section IV.D. to address only whole number representations for the mean number of spills estimated to occur and contact individual land segments and special targets.

5. Chronic or Long-term Oil Pollution

a. Sources of Hydrocarbon Inputs into the Gulf of Mexico

Sources which contribute as hydrocarbon inputs into the Gulf of Mexico include natural seeps, accidental spills, and long-term, low-level discharges. The presence of hydrocarbons in the marine environment is, to some extent, unavoidable. Those hydrocarbons found in the world's oceans are generated by both natural, biological, and geochemical processes, and anthropogenic inputs. The majority of these hydrocarbons are introduced into the sea as a result of man's activities: coastal refining; industrial waste disposal; urban and river runoff; transportation losses; and offshore oil and gas activities.

Figure IV-2 illustrates the probable amounts of hydrocarbons which annually enter into the Gulf of Mexico OCS from the major offshore, coastal, and land-based sources. The figure illustrates that man's activities alone annually contributes in excess of 85% of the chronic hydrocarbon contamination which enters into the Gulf's waters. Of this, it is estimated that some 1.6% is contributed by offshore and domestic oil/gas activities and 4.8% is a result of maritime transportation activities. In contrast, only an estiamted 9% is attributable to natural seepage. For a more detailed discussion of this subject, see Table IV-26 and Appendix E of the Final Regional EIS.

The OCS spill rates for spills greater than or equal to 1,000 bbls (major spill events) occurring are:

From Platforms	1.0 spill incidents per billion bbls produced
From Pipelines	1.6 spill incidents per billion bbls transported

The OCS spill rate for spills between 1 bbl and 999 bbls, from either pipeline or platform, is 379 spills per billion bbls produced or transported.

The vast majority of spills are small (99% were less than 50 bbls and 89% were less than 1 bbl). The volume of oil spilled from these small spills is insignificant compared to production (2.3 bbls spilled per million barrels produced).

Table IV-19

Oil Spill Risk Analysis, Central Gulf: Estimates of Oil Spills (1,000 bbls or greater) Occurring and Contacting Land Segments and Targets Within 10 Days

Land Segment/Target	Central Gulf[1] Sale 104 M Scenario		M Scenario[2] Gulfwide Existing		Gulfwide[3] Cumulative		Central Gulf[4] T Scenario		Central Gulf[5] H Scenario	
	prob	mean	prob	mean	prob	mean	prob	mean	prob	mean
10 Galveston, TX	n	0.0	30	0.4	41	0.5	1	0.0	n	0.0
11 Jefferson, TX	n	0.0	6	0.1	16	0.2	2	0.0	n	0.0
12 Cameron, LA	2	0.0	37	0.5	41	0.5	15	0.2	3	0.0
13 Vermilion, LA	3	0.0	41	0.5	41	0.5	20	0.2	5	0.1
14 Iberia, LA	2	0.0	30	0.4	30	0.4	15	0.2	3	0.0
15 St. Mary, LA	n	0.0	3	0.0	3	0.0	1	0.0	n	0.0
16 Terrebonne, LA	5	0.1	62	1.0	65	1.0	38	0.5	9	0.1
17 Lafourche, LA	2	0.0	33	0.4	44	0.6	11	0.1	3	0.0
18 Jefferson, LA	1	0.0	42	0.5	44	0.6	8	0.1	2	0.0
19 Plaquemines, LA	3	0.0	76	1.4	76	1.4	36	0.4	5	0.1
20 St. Bernard/Orleans/ St. Tammany, LA	2	0.0	39	0.5	40	0.5	17	0.2	3	0.0
21 Hancock/Harrison/ Jackson, MS	n	0.0	4	0.0	8	0.1	1	0.0	n	0.0
22 Mobile, AL	n	0.0	2	0.0	4	0.0	1	0.0	n	0.0
23 Baldwin, AL	n	0.0	n	0.0	2	0.0	n	0.0	n	0.0
Land	18	0.2	**	6.5	**	7.4	86	2.0	30	0.4
Archaeological Sites	1	0.0	56	0.8	66	1.1	12	0.1	2	0.0
Brown Pelican Habitats	4	0.0	77	1.5	80	1.6	29	0.3	8	0.1
LA Recreational Beaches	3	0.0	66	1.1	74	1.4	22	0.2	5	0.0
MS Recreational Beaches	n	0.0	5	0.0	9	0.1	1	0.0	n	0.0
AL Recreational Beaches	n	0.0	3	0.0	5	0.0	1	0.0	n	0.0
Gulf Recreational Beaches	3	0.0	87	2.0	93	2.6	23	0.3	5	0.1
Flower Garden Banks	n	0.0	4	0.0	11	0.1	1	0.0	n	0.0
Gulf Seagrass Beds	9	0.1	92	2.5	95	3.0	58	0.9	16	0.2
Vermilion/Atchafalaya Bays	3	0.0	40	0.5	40	0.5	21	0.2	5	0.1
Timbalier Bay	1	0.0	21	0.2	29	0.3	8	0.1	2	0.0
Barataria Bay	1	0.0	48	0.6	49	0.7	9	0.1	2	0.0
Breton/Chandeleur Sounds	n	0.0	5	0.0	5	0.1	2	0.0	n	0.0
LA Endangered Species	7	0.1	94	2.9	96	3.1	56	0.8	12	0.1
MS Endangered Species	n	0.0	4	0.0	8	0.1	1	0.0	n	0.0
Gulf Endangered Species	7	0.1	97	3.6	98	4.0	57	0.8	11	0.1
Gulf Islands Nat. Seashore	n	0.0	6	0.1	11	0.1	2	0.0	n	0.0
LA Mangroves	8	0.1	85	1.9	88	2.1	54	0.8	15	0.2
Gulf Mangroves	8	0.1	85	1.9	88	2.1	54	0.8	5	0.2
TX Marshes	n	0.0	46	0.6	63	1.0	3	0.0	n	0.0
LA Marshes	17	0.2	99	5.2	**	5.6	84	1.8	29	0.3
MS Marshes	n	0.0	4	0.0	8	0.1	1	0.0	n	0.0
AL Marshes	n	0.0	3	0.0	6	0.1	1	0.0	n	0.0
Gulf Marshes	18	0.2	**	5.9	**	6.7	85	1.9	30	0.4
TX Seagrass Beds	n	0.0	30	0.4	41	0.5	1	0.0	n	0.0
LA Seagrass Beds	9	0.1	85	1.9	88	2.1	54	0.8	15	0.2
MS Seagrass Beds	n	0.0	4	0.0	8	0.1	1	0.0	n	0.0
AL Seagrass Beds	n	0.0	2	0.0	4	0.0	1	0.0	n	0.0
Galveston Bay	n	0.0	30	0.4	41	0.5	1	0.0	n	0.0
Mobile Bay	n	0.0	3	0.0	6	0.1	1	0.0	n	0.0

Note: Land segments and special targets not relevant to this sale are not listed in this table.

Prob - indicates the probability (expressed as percent chance) of one or more oil spills occurring and contacting a land segment or target.
n = less than 0.5%, ** = greater than 99.5%.

Mean - is the mean or expected number of spills occurring and contacting a land segment or target.
0.0 = less than 0.05 spills.

[1] Based on the production of undiscovered economically recoverable oil resources estimated in the M Scenario for Sale 104.

[2] Based on the production of the resources estimated in the M Scenario plus the production of all oil reserves in existing leases Gulfwide (WPA, CPA, and EPA).

[3] Based on the M Scenarios for both the proposed Western and Central Gulf sales combined plus Gulfwide existing leases and imports.

[4] Based on the production of all undiscovered economically recoverable oil resources in the CPA (T Scenario - total mean conditional estimates).

[5] Based on the production of undiscovered economically recoverable oil resources estimated in the H Scenario for Sale 104.

Source: Compiled from Tables 4, 4a, 5, 6, 6a, 7, 10, 10a, 11, B-3, B-3a, and B-4 in Anderson et al., 1985.

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Table IV-20

Oil Spill Risk Analysis, Western Gulf: Estimates of Oil Spills (1,000 bbls or greater) Occurring and Contacting Land Segments and Targets Within 10 Days

Land Segment/Target	Western Gulf[1] Sale 105 M Scenario		M Scenario[2] Gulfwide Existing		Gulfwide[3] Cumulative		Western Gulf[4] T Scenario		Western Gulf[5] H Scenario	
	prob	mean	prob	mean	prob	mean	prob	mean	prob	mean
1 Cameron, TX	n	0.0	2	0.0	2	0.0	7	0.1	n	0.0
2 Willacy, TX	n	0.0	2	0.0	2	0.0	2	0.0	n	0.0
3 Kenedy, TX	n	0.0	15	0.2	15	0.2	6	0.1	n	0.0
4 Kleberg, TX	n	0.0	9	0.1	10	0.1	7	0.1	1	0.0
5 Nueces, TX	1	0.0	12	0.1	13	0.1	14	0.2	1	0.0
6 Aransas, TX	n	0.0	2	0.0	4	0.0	2	0.0	n	0.0
7 Calhoun, TX	n	0.0	2	0.0	4	0.0	2	0.0	1	0.0
8 Matagorda, TX	2	0.0	8	0.1	9	0.1	7	0.1	3	0.0
9 Brazoria, TX	3	0.0	14	0.2	18	0.2	13	0.1	5	0.0
10 Galveston/Chambers, TX	7	0.1	35	0.4	41	0.5	33	0.4	12	0.1
11 Jefferson, TX	n	0.0	6	0.1	16	0.2	1	0.0	n	0.0
12 Cameron, LA	n	0.0	36	0.4	41	0.5	n	0.0	n	0.0
13 Vermilion, TX	n	0.0	39	0.5	41	0.5	n	0.0	n	0.0
14 Iberia, LA	n	0.0	28	0.3	30	0.4	1	0.0	n	0.0
15 St. Mary, LA	n	0.0	3	0.0	3	0.0	n	0.0	n	0.0
16 Terrebonne, LA	n	0.0	60	0.9	65	1.0	2	0.0	n	0.0
Land	13	0.1	**	6.4	**	7.4	67	1.1	21	0.2
Archaeological Sites	5	0.1	57	0.9	66	1.1	28	0.3	9	0.1
Brown Pelican Habitats	2	0.0	76	1.4	80	1.6	23	0.3	4	0.0
Sea Turtle Nesting	1	0.0	39	0.5	41	0.5	35	0.4	2	0.0
Texas Recreational Beaches	10	0.1	62	1.0	66	1.1	57	0.8	18	0.2
Gulf Recreational Beaches	10	0.1	88	2.1	93	2.6	57	0.8	18	0.2
Flower Garden Banks	1	0.0	4	0.0	11	0.1	6	0.1	1	0.0
Gulf Seagrass Beds	8	0.1	92	2.5	95	3.0	36	0.4	13	0.1
Vermilion/Atchafalaya Bays	n	0.0	38	0.5	40	0.5	1	0.0	n	0.0
TX Endangered Species	6	0.1	50	0.7	56	0.8	47	0.6	10	0.1
Gulf Endangered Species	6	0.1	97	3.5	98	4.0	47	0.6	10	0.1
Padre Island Nat. Seashore	1	0.0	24	0.3	25	0.3	14	0.2	1	0.0
LA Mangroves	n	0.0	83	1.8	88	2.1	2	0.0	n	0.0
Gulf Mangroves	n	0.0	83	1.8	88	2.1	2	0.0	n	0.0
TX Marshes	11	0.1	52	0.7	63	1.0	46	0.6	19	0.2
LA Marshes	n	0.0	99	5.0	**	5.6	4	0.0	n	0.0
Gulf Marshes	11	0.1	**	5.8	**	6.7	48	0.7	19	0.2
TX Seagrass Beds	7	0.1	35	0.4	41	0.5	33	0.4	12	0.1
LA Seagrass Beds	n	0.0	84	1.8	88	2.1	3	0.0	n	0.0
Galveston Bay	7	0.1	35	0.4	41	0.5	33	0.4	12	0.1

Note: Land segments and special targets not relevant to this sale are not listed in this table.

Prob - indicates the probability (expressed as percent chance) of one or more oil spills occurring and contacting a land segment or target.
n = less than 0.5%; ** = greater than 99.5%.

Mean - is the mean or expected number of spills occurring and contacting a land segment or target.
0.0 = less than 0.05 spills.

[1] Based on the production of undiscovered economically recoverable oil resources estimated in the M Scenario for Sale 104.

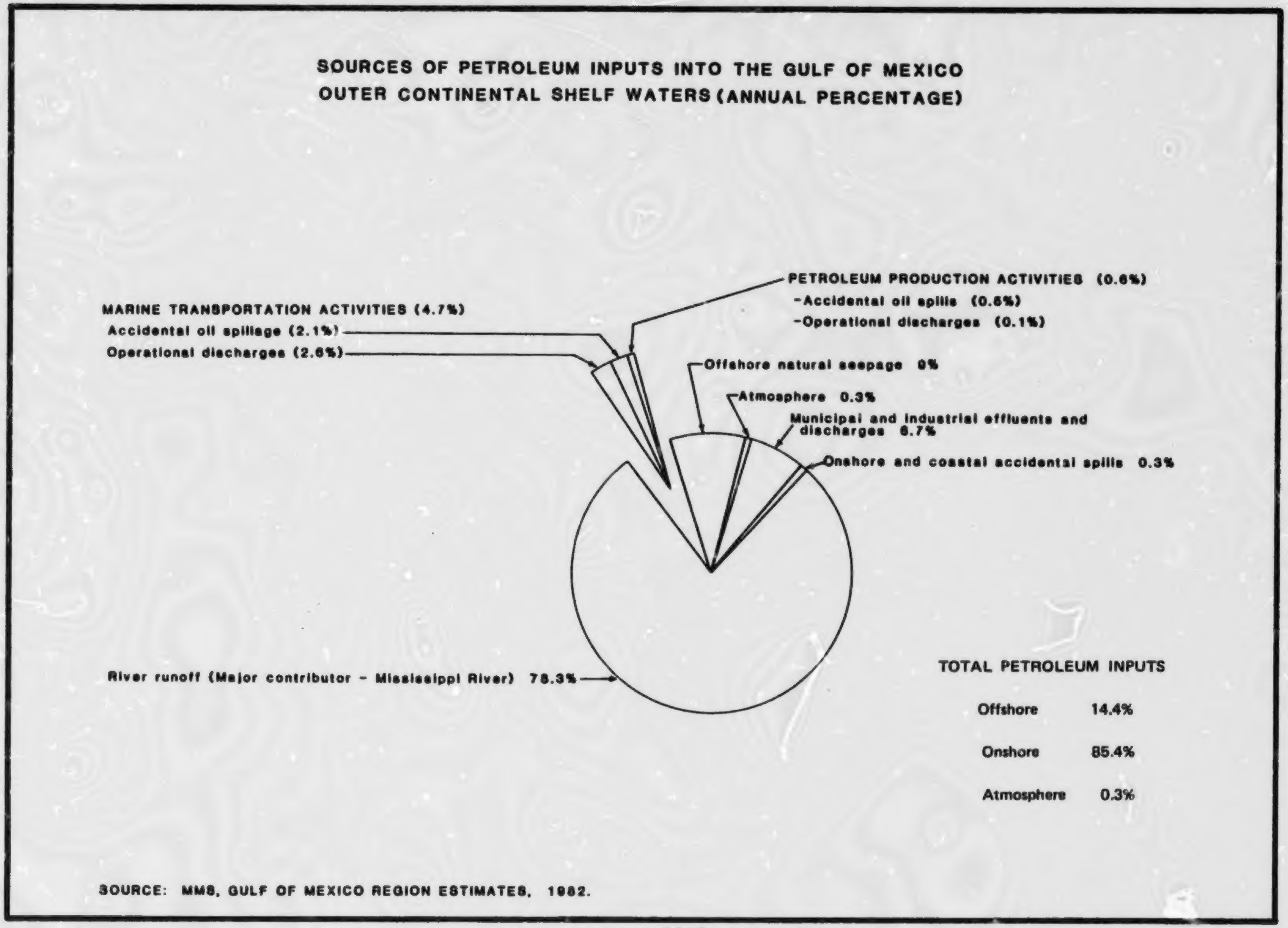
[2] Based on the production of the resources estimated in the M Scenario plus the production of all oil reserves in existing leases Gulfwide (WPA, CPA, and EPA).

[3] Based on the M Scenarios for both the proposed Western and Central Gulf sales combined plus Gulfwide existing leases and imports.

[4] Based on the production of all undiscovered economically recoverable oil resources in the WPA (T Scenario - total mean conditional estimates).

[5] Based on the production of undiscovered economically recoverable oil resources estimated in the H Scenario for Sale 105.

Source: Compiled from tables 2, 2a, 3, 6, 6a, 7, 8, 8a, 9, B-1, B-1a, and B-2 in Anderson et al., 1985.



SOURCES OF PETROLEUM INPUTS INTO THE GULF OF MEXICO OUTER CONTINENTAL SHELF WATERS (ANNUAL PERCENTAGE)

SOURCE: MMS, GULF OF MEXICO REGION ESTIMATES, 1982.

Figure IV-2. Sources of Petroleum Inputs into the Gulf of Mexico Outer Continental Shelf Waters (annual percentage).

b. Sublethal and Long-term Effects of Chronic or Low-level Oil Pollution

The sublethal effects on marine organisms resulting from low-level chronic oil discharges and small spills may prove to be the most harmful impact to the marine ecosystem in areas exposed to long-term oil exploration activities. Little is known about low concentration oil pollution and there exists too small a consensus to support any definitive assessment at present. It is not known if petroleum introduction into the marine environment is causing significant deleterious and chronic effects, and even more important, if this contamination is producing a long-term significant alteration of the marine environment.

Sublethal effects are defined as those that impair the ability of an organism to function effectively without causing direct mortality, although these effects can be directly lethal. Usually sublethal and/or long-term effects are associated with low concentrations of petroleum which may be present in the marine environment due to chronic low-level oil discharges and small spills (less than 1,000 bbls) or from large spills in which evaporation, degradation, and dispersion of the spilled hydrocarbons ultimately result in the formation of sublethal concentrations.

Low-level chronic oil pollution may have more long-term harmful consequences to the ecosystem than the isolated large spills (i.e., spills greater than or equal to 1,000 bbls) which the public, as a whole, fears the most. The issue over the effect of low-level oil contamination versus catastrophic spills seems to be supported from both sides.

Accumulation of petroleum hydrocarbons from crude oil by organisms in areas of chronic petroleum contamination is well-documented both in the field and the laboratory, much more so than the effects of these sublethal quantities (Milan and Whelan, 1978; Ehrhardt, 1972). More work is needed on a systematic study of the uptake and the response of petroleum by an ecosystem.

There are several routes via which hydrocarbons enter the marine food web. Uptake processes include: (1) adsorption onto particles by living and dead matter, followed by ingestion of these particles; (2) active uptake of dissolved or dispersed petroleum; and (3) passage into the gut of fish which gulp or drink water. Uptake into body tissues may occur through respiratory surfaces, gastrointestinal tract, and external surfaces.

Sublethal levels of petroleum accumulation by the aquatic environment may interfere in the normal physiological processes and behavioral responses of marine organisms. Sublethal effects can include: (1) disruption of normal behavior-finding, breeding, and locomotion; (2) interference with thermo-regulation; (3) interference with the ability to locate food and avoid predators; (4) disruption of homing behavior; and (5) interference with the ability to locate mates or other sexual stimuli; all of which are necessary for the propogation and survival of marine species. Other harmful indirect effects include: (6) destruction of food sources; (7) synergistic effects that reduce resistance to other stresses; and (8) incorporation of carcinogenic and potential metagenic chemicals.

There are serious limitations in understanding ecological effects of sublethal concentrations of petroleum hydrocarbons in aquatic ecosystems. A basis for developing such an understanding must be an understanding of the processes operating in the Gulf ecosystem in its natural state. Such an understanding is not available now. The Gulf marine ecosystem is already burdened by pollution from other chemical compounds such as pesticides. The assimilative capacity for petroleum loading should be determined. The timeframe and the concentrations that a system must be exposed to have irreparable damage is presently unknown.

The MMS Environmental Studies Program is striving to place more emphasis on assessing the environmental and ecological long-term impacts from OCS oil and gas development. The Washington Office Branch of Environmental Studies is developing a program plan for the design of studies to assess long-term impacts. This program is being coordinated with the Interagency Committee on Ocean Pollution Research, Development, and Monitoring (COPRDM). Dr. D. Boesch of LUMCON is serving as project manager of a project that will develop "recommendations for the development of an environmental research and monitoring program to quantify and evaluate the significance of subtle and long-term effects of oil and gas activities." In the near future, the National Academy of Sciences will release an update of its review (1975) which will summarize what is known about petroleum in the marine environment.

6. Characteristics, Fates, and Effects of a Typical Oil Spill Occurring from OCS Oil Development Activities

Spilled Louisiana crude disperses and degrades rapidly under the influences of the Gulf's warm climatic conditions, and within a few days the spilled oil has disappeared. By modeling the mass balance of a typical Gulf oil spill (Table IV-21), it is shown that the natural weathering and degradation processes will remove nearly all of the original volume of spilled Louisiana light crude within 30 days. Louisiana crude and some other northern Gulf coast crudes do not seem to form tar balls (Jeffrey et al., 1974). Based on limited data on Gulf coast oil spillage, concentrations of spilled petroleum that reach coastal sediments degrade to background levels within 1-2 years. No known significant harmful, short-term effects on Gulf coastal or open water environments have been identified from oil spills from OCS oil and gas development (USDI, MMS, 1983a).

a. Characteristics

It is assumed that spills occurring due to the proposed actions will have characteristics similar to Louisiana crude (a light, very low asphaltene oil), although variations in composition can be expected from oils produced from different formations or fields within each region or between areas. Properties of south Louisiana crude are:

API Gravity (20°C)	34.5
wt% Naptha Fraction (boiling from 20° to 150°C)	18.6
wt% Saturates - High Boiling	56.3
wt% Aromatics - High Boiling	16.5
wt% Insolubles (Asphaltenes)	0.2
wt% Polar Materials	8.4

Source: Jordan and Payne, 1980.

In order to study the fate of a typical oil spill, an average size spill was determined based on major historic oil spills greater than or equal to 1,000 bbls. The average size is 17,222 bbls. Due to few extremely large spills, however, the most likely size spill is around 2,000 bbls. Assumptions made in this document about any chemical and physical alterations to the spilled oil is based on the average size spill.

b. Fates

A variety of processes occur when oil is spilled on water, altering its chemical and physical characteristics. Collectively, these are referred to as weathering or aging of the oil and will determine, to a large degree, its fate. Spilled Louisiana crude disperses and degrades rapidly under the influences of the Gulf's warm climatic conditions and the properties of the oil. Times for the dominant effects of the weathering processes (a mass balance), as well as the percent volume loss from the slick from the sea surface after 10 and 30 days are indicated in Table IV-21.

Ten days is chosen as the most likely oil slick sea surface residence time, and the Oil Spill Risk Analysis Model focuses on the 10-day time frame. After ten days, the oil properties have changed extensively. The original volume has decreased greatly; 47%-67% of the original slick volume is lost from the water's surface. The floating oil is largely devoid of its volatile (acutely toxic) components and is gradually forming emulsions. By four days, enlargement of the slick is completed, and actual spreading is subordinate to fragmentation and dispersion (Wheeler, 1978).

Table IV-21

Mass Balance of a Typical Gulf of Mexico Oil Spill[1]

Process	Time Scale (in days)	% Loss of Original Slick Volume 10 days	% Loss of Original Slick Volume 30 days
Evaporation	1-10	45%*-25%	45%*-25%
Dissolution	1-10	less than 1%	1%*-5%
Dispersion	1-30	10%	included in sinking and sedimentation rate
Auto-oxidation	3-365	less than 1%	5%
Biodegradation	5-720	1%	included in sinking and sedimentation rate
Sinking and Sedimentation	10-365	1%	34%*-20%
Tar Residue	10-365	less than 1%	1%*-30%
Offshore Skimming and Recovery Cleanup Operations		10%	15%
Total Volume Loss from Water Surface		67%*-47%	100%

[1] Assumption is that spill does not contact land.

*Ranges given provide an overview of crude oil fate in general. The first number (with an asterick) represents the most likely percent loss of Louisiana crude due to that process.

Source: Jordan and Payne, 1980.

Dominant processes affecting spilled oil during 10 days or less include spreading, evaporation, dissolution, and dispersion. Dominant processes altering a slick's characteristics after 10 days include emulsion formation, sedimentation, auto- and photo-oxidation, biological processes, and tar residue formation (Jordan and Payne, 1980).

Slick Dynamics

NOAA's Scientific Support Coordinator (SSC) is responsible for providing oil spill trajectories to the designated Federal On-Scene Coordinator. The SSC obtains this information from the Trajectory Modeling Support Group of NOAA's Hazardous Materials Response Branch.

Oil in the Water Column

When initially spilled, most crude oils float. However, some of the spilled oil is found dispersed and retained in the water column (Figure IV-3).

About 1%-5% of the volume of the surface slick is predicted to occur in the water column in the vicinity of the spill. Some of this oil will reach bottom sediments (MacKay, 1979; Rhode Island, University of and Applied Science Associates, 1981; and Boehm and Fiest, 1980). The relative amount of oil which resides in the water column is a function of a number of factors, including the chemical and physical nature of the oil, the point of release (surface versus subsurface), and the hydrographic conditions affecting the slick formed, particularly the sea surface turbulence. The location of subsurface oil is governed by the density stratification of the water column. The submerged oil exists in association with strong water temperature and salinity gradients.

Fiest and Boehm (1980) reviewed the literature reporting concentrations of oil in water and found that the average reported concentrations generally were: less than 1 mg/l for pristine areas; 2-100 mg/l under spills occurring in nearshore areas; and 100-800 mg/l in heavily polluted urban environments. General background values for the Gulf of Mexico were from nondetected to 70 mg/l. The higher value indicates a chronic paraffinic oil intrusion.

The concentrations of oil in the water column measured around the site of the IXTOC blowout, a 3.3 million bbl spill, ranged from values of less than 5 mg/l at a distance of 80 km from the blowout to peak values of 10,600 mg/l within a few hundred meters of the wellhead. The highest concentrations were observed within 25 km of the blowout in the top 6 m of the water column (Fiest and Boehm, 1980). Fiest and Boehm (1980) compared these IXTOC results to other major spills and, except for the very high concentrations found beneath the surface slick, found that values measured at the outside edge of the oil plume were similar to the maximum values measured during other major spills (Ekofisk blowout, 2-300 mg/l; Amoco Cadiz, 350 mg/l; Argo Merchant, 450 mg/l).

The mechanisms which result in oil being retained in the water column include: dissolution, dispersion, sinking, sedimentation, and subsurface plume formation.

> Dissolution: Lower molecular weight hydrocarbons, in particular aromatics such as benezene and toluene that are acutely toxic, will rapidly dissolve into the water column once oil is spilled.
>
> Dispersion: The agitation of oil slicks due to the breaking of waves and the action of the surf supplies the energy to form small droplets of stable emulsions from 5 micrometers to several millimeters in size. Such droplets are then pushed into the water column and dispersed. Dispersion of a surface slick is an important process in determining the lifetime of the slick. The formation of droplets increases the surface area of the oil, thereby increasing the rates of physical, chemical, and biological processes affecting the weathering of the oil.
>
> Sinking: Whole oil particles in the form of mousse or tar could become heavier than the surrounding water and sink until encountering an interface strong enough to inhibit penetration (Walter and Proni, 1980).

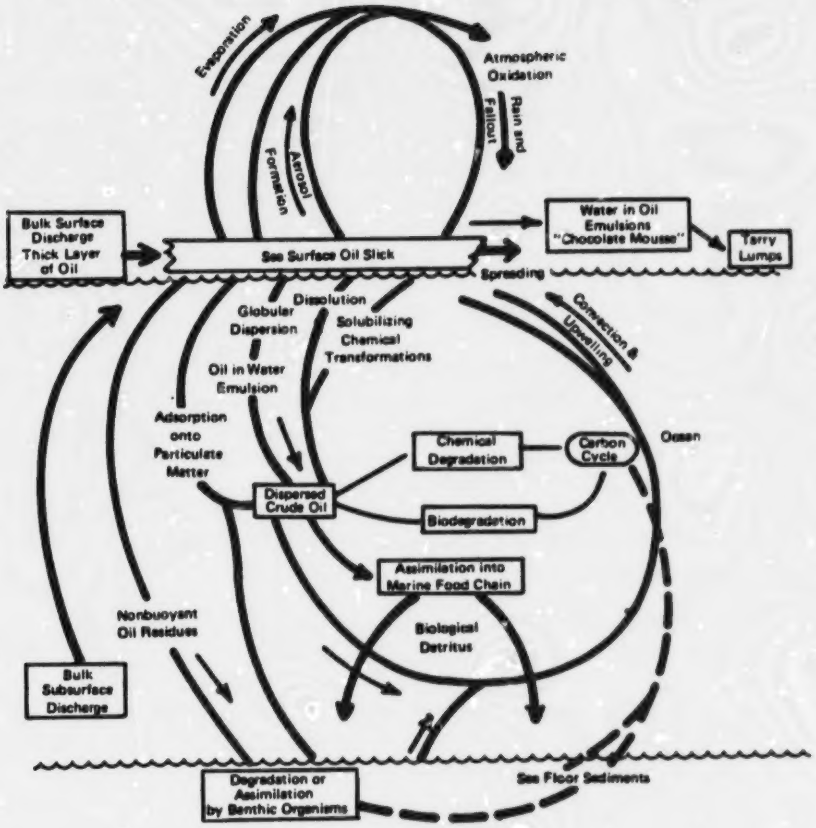

Evaporation
Atmospheric Oxidation
Rain and Fallout
Aerosol Formation
Bulk Surface Discharge Thick Layer of Oil
Sea Surface Oil Slick
Water in Oil Emulsions "Chocolate Mousse"
Tarry Lumps
Spreading
Dissolution
Globular Dispersion
Solubilizing Chemical Transformations
Convection & Upwelling
Oil in Water Emulsion
Adsorption onto Particulate Matter
Chemical Degradation
Carbon Cycle
Ocean
Dispersed Crude Oil
Biodegradation
Assimilation into Marine Food Chain
Biological Detritus
Nonbuoyant Oil Residues
Bulk Subsurface Discharge
Degradation or Assimilation by Benthic Organisms
Sea Floor Sediments

Figure IV-3. Processes Affecting the Fate of Spilled Oil (reprinted from Jordan and Payne, 1980).

Sedimentation: This process is characterized by oil associating with particulate material in the water column. In the case of the IXTOC blowout, in several instances, particulates-bound oil was found where surface slicks were not readily apparent (Payne et al., 1980). To explain this, it was hypothesized that once oil had been absorbed onto particulates, it was then subject to subsurface horizontal and vertical advective transport and could be transported a considerable distance before settling to the bottom. Payne et al. (1980) reviewed the literature on particulate/oil interactions and concluded that these interactions are a dominant process in the ultimate disposition of petroleum.

Subsurface Plume Formation: Fiest and Boehm (1980), Walter and Proni (1980), and others examining the characteristics of the IXTOC blowout determined that a significant quantity of the oil released at the subsurface from the wellhead formed a subsurface plume of oil droplets suspended in a mixed layer at a depth of 5-20 m. The oiled seawater plume moved in response to ocean currents rather than the wind. An oceanic frontal system may have acted as a barrier to the lateral transport of the oil plume and may also have acted as a conduit for the subsurface movement of oil along the frontal axis. Within 5 km from the wellhead, the subsurface plume was made up of oil droplets greater than 0.45 um and had petroleum hydrocarbon concentrations greater than 600 ug/l. Such whole oil was found at concentrations (greater than 20 ug/l) at 20 m depths within 25 km from the well (Fiest and Boehm, 1980). Although there appeared to be other processes not identified controlling the transport of the subsurface plume from those controllng the movement of the surface slick, the subsurface plume was, for the most part, aligned with the surface slick.

Water samples taken from this subsurface plume were considerably enriched in light aromatics relative to other aromatic components, presumably due to the presence of considerable quantities of soluble, solubilized, or colloidal material in the water. The fact that the subsurface oil can be characterized by a different chemistry and weathering regime implies that the subsurface oil is a "fresh" oil plume which has remained subsurface since its discharge, and in which evaporative loss of aromatics is greatly decreased (Boehm and Fiest, 1980).

Of particular importance is the fact that concentrations of some of the more toxic components appeared in the water column in sizeable amounts. The concentrations of individual hydrocarbons in the dissolved fraction (0.01-3 ppb) measured in a study by Boehm and Fiest (1980) on oil in the IXTOC water column appeared to lie below the toxic range, even in the acute impact zone. However, the total concentration of water-borne low molecular weight aromatics (alkyl benzenes and naphthalene compounds) in water fell in the 0.5-500 ppb range, and concentrations of total water-borne oil dispersions were in the 100-10,000 ppb (0.10-10 ppm) range. The researchers report that these values fall well within the range of observable effects on marine organisms.

c. Effects of Oil Spillage

The majority of oil spills that have occurred in connection with oil industry operations in the Gulf have probably resulted in no serious short-term deleterious effects. This conclusion is based on the sparse documentation available on the historic effects of oil spills on the Gulf shoreline and on the information presented in Volume 1, Section IV.B.3. of the Final Regional EIS on the fate of spilled Louisiana crude.

Each spill is a unique event, with a number of factors interacting to determine its effects, and all spills occurring in the Gulf could be potentially harmful. The variability encountered in the literature on environmental effects of oil spills is due to differences in oil components, environmental conditions, and the organisms encountered.

Although unanswered questions will remain on the subject of oil impact, some general conclusions about the effects of oil spills are widely accepted.

(1) Short-term effects of spilled oil in the marine environment are usually not extensive. The marine environment recovers within a short time if the stress is removed or reduced significantly. Oil spills in some coastal areas, particularly shallow estuarine or wetland environments, could result in long term effects to flora and fauna (NAS, 1975).

(2) Seabirds, particularly those which dive into the water, have been the most notorious victims of spills. In addition to mortality of individuals, some bird populations make a slow recovery from oil-caused losses because they reproduce few at a time or because residual oil may impair reproduction (NAS, 1975; Macko and King, 1980).

(3) Bottom dwellers have been shown to be susceptible to oil spills (Byrne and Calder, 1977; Tatem et al., 1978; and NAS, 1975). Benthic organisms can become coated with heavy oil and smothered. As filter feeders, they also ingest oil present in water. The most sensitive organisms appear to be small crustaceans, or crustacean larvae (Anderson, 1979). Recent field studies suggest less ecological damage than investigators earlier thought to benthos associated with offshore oil installations, oil spills, or natural marine oil seepage (Middleditch and Basile, 1980; ERCO, 1982; Ward et al., 1980; and Davis and Spies, 1980).

(4) Adult pelagic fish are, for the most part, able to avoid spilled floating oil in open water areas by swimming away from the affected region. However, other stages of the fish life cycle are more susceptible to acute biological loss. Fish eggs and larvae are vulnerable to oil damage in the open water environment as they float along. Furthermore, spills reaching nearshore bays, and spawning or breeding grounds, could cause serious detrimental effects (NAS, 1975).

(5) Phytoplankton and zooplankton, critical components of the marine ecosystem, have demonstrated differing reactions to oil (Wong et al., 1981; Gordon and Prouse, 1973; NAS, 1975; and Casey et al., 1982). Researchers have documented changes in the ecosystem following an oil spill in terms of type of primary and secondary producers. The primary productivity of phytoplankton may be reduced during an oil spill episode. Normal growth is restored after the episode passes. Low concentrations of oil have been shown to stimulate the growth of phytoplankton or to have no effect. Zooplankton populations may increase after a spill either because of their feeding on dead phytoplankton or on oil particles themselves. In an experiment conducted by the University of Texas on the toxicity of various oils to representative species of microalgae, Louisiana crude was not toxic (Parker and Menzel, 1974).

(6) Short-term biological loss occurs from an oil spill by direct kill through coating and asphyxiation, by contact poisoning or incorporation of water-soluble toxic carcinogenic or mutagenic components of oil, or by destruction of the generally more sensitive juvenile forms of organisms or of the food source of higher trophic species and by modification of habitats, and delaying or preventing recolonization (Blumer, 1971).

(7) The severity of oil pollution on different organisms in various habitats varies from no effect to responses of avoidance, decreased activity, or physiological stress. Not only do different species react differently, but different life stages of an organism will show different tolerances to petroleum hydrocarbons. What is toxic to one organism may not be toxic to the next. The concentration of hydrocarbons in marine organisms exposed to oil reflects various levels of uptake, metabolism, storage, and discharge. In general, benthic algae, zooplankton, benthic invertebrates, and fish can depurate hydrocarbons accumulated after exposure to oil. Bivalves, including clams, oysters, and mussels, do not possess the enzyme system, or detoxification system as it is called, and tend to accumulate hydrocarbons (Lee, 1977).

(8) The threat of ground and surface water contamination caused by oil spills on land is often overlooked in favor of the more obvious and immediate effects to surface vegetation and soil. Many of the barrier island communities throughout the Gulf of Mexico obtain their municipal water supplies from the shallow aquifer systems underlying these islands. Therefore, the threat exists for oil spilled in the Gulf of Mexico to come ashore, percolate through the barrier beach sands, and contaminate an island's water supply. In a paper by Duffy et al. (1977), the persistence of water-soluble hydrocarbons from crude oil spills on land was investigated as a source of groundwater contamination. This was accomplished by means of theoretical modeling, percolation

experiments, and the analysis of core samples from various spill sites. Their findings suggest that the water-soluble components of crude oil spilled on land are very persistent and could represent long-term environmental threats to a groundwater supply. They further suggest that damage to water resources from hydrocarbon spills on land can be long-lived even if not widespread and that contamination to a groundwater system by hydrocarbons may not appear until several decades after a spill has occurred. Once detected, however, the technology exists to locate and recover an underground accumulation of spilled hydrocarbon on top of groundwater in an aquifer system, as illustrated in an article by Mathes (1982). The success of the methodologies and recovery strategies used on a petroleum products spill that entered the Mississippi Aquifer around St. Louis, Missouri, is discussed in this article. Therefore, although the probability of such an event occurring in the Gulf exists, it appears that the technology exists to recover such a spill, once it has been detected in a water supply.

(9) There is still little known about the long-term or sublethal effects of oil contamination. Long-term or sublethal effects due to low-level concentrations of oil in the environment would be due to oil entering the Gulf from many sources. Spills from oil operations are just one of the sources. For a discussion on the subject, see Section IV.B.5.

d. Factors Affecting the Severity of Oil Spill Impact

The ultimate impact and recovery of a coastal area or offshore environment contacted by spilled oil depend on a number of interacting factors. The dispersion of oil in water, its movements, chemical modifications, effects on aquatic organisms and the shoreline, and persistence in the sea are all influenced by: (1) type and characteristics of the oil (for example, viscosity and percent aromatics); (2) amount and duration of oil spilled; (3) sea state, currents, and wave activity; (4) location of the spill, including the physiography of the area and the distance from shore; (5) the geographical and morphological configuration of the affected coast, including textural characteristics of shore sediments; (6) climatic conditions, in particular temperature, wind, and solar radiation, (7) the value and/or characteristics of an area, in particular the biota present and the socioeconomic considerations; (8) season of the spill; (9) previous exposure of the area to oil; (10) exposure to other pollutants; and (11) effectiveness of mitigating measures taken by appropriate Federal and State agencies.

(1) Crude Oil Characteristics and Toxic Effects

The toxicity of petroleum on marine organisms is dependent upon the concentration and composition of its individual hydrocarbons at the time of impact. The relative impact of the oil will shift as spilled oil weathers due to the change in its chemical composition.

Crude oil is a complex mixture of alkanes (aliphatic), naphthenes (cyclo paraffinic), aromatics, and asphaltics (asphaltenic and heterocyclic compounds containing oxygen, sulfur, or nitrogen). The low molecular weight components are considered acutely toxic but are rapidly lost through evaporation and solution during the first days of a spill. High molecular weight aliphatics are the least toxic, although they may have an anesthetic or narcotic effect if concentrations were great enough. As part of the slick on the surface of the water, they may coat marine birds.

In general, the relative toxicity of an oil is directly proportional to its aromatic content. Studies have shown lower molecular weight aromatic hydrocarbons (benzenes and toluenes) to be moderately toxic to a variety of animals. Intermediate molecular weight aromatic hydrocarbons (naphthalenes) have been found toxic to phytoplankton and many species of aquatic animals. However, the benzenes and naphthalenes are quickly lost to the atmosphere or diluted into the water column. Higher boiling aromatics act as slower poisons than low-boiling aromatics but are equally severe in their effects. The most toxic aromatics are phenanthrenes. Some aromatics that exist in low concentrations in crude oil have been found to be carcinogenic (Blumer, 1971). The polynuclear aromatic hydrocarbons exhibit very low solubilities and are generally most resistant to weathering processes. These and the toxic NSO compounds, as well as most of the heavy metals found in crude oil, will tend to remain in the tarry residue.

Although laboratory toxicity tests show that the deleterious effects of oil are related to its chemical components, the form of oil at sea is just, if not more, as important in determining toxicity. That portion of the oil that dissolves, the water soluble fraction (WSF), appears to be the most highly toxic to organisms, possibly due to the easier uptake of oil in this form (Ottway, 1976; Winters and Parker, 1977). Water-in-oil emulsions of spilled oil are likely to cause biological damage due to physical effects, while oil-in-water emulsions probably cause more biological damage due to toxic effects. Oil in dispersed droplets exhibits slightly less toxicity than the WSF's. Therefore, although high molecular weight aromatics are least degraded in oil and show high toxicity in laboratory tests, the relative toxicity of the lower boiling aromatics may be more important due to their enrichment in the aqueous phase, specifically the naphthalene hydrocarbons.

Toxicities vary between oil types because the concentration and composition of individual hydrocarbons with the oil vary. In general, refined oils are considered more toxic than crude oils due to their high aromatic hydrocarbon concentrations and their greater ability to mix into the water column as a result of their less viscous nature. In general, spills of crude oils, residual fuel, and lubricating oils are more likely to cause biological damage by virtue of their viscous physical properties when considered over a length of time, while spills of refined oil, including gasolines and kerosenes, are likely to cause biological damage by virtue of their toxic nature over a relatively short period of time (Ottway, 1976).

(2) Marine and Meteorologic Conditions

Once the oil enters the water, its transport is controlled by: (1) wind direction, velocity, and duration; (2) surface water currents; and (3) time of the major oil release. Calm water, a light breeze, and warm temperature favor rapid cleanup operations, fast evaporation rates, and minimal mixing between the oil and the water column. Rough seas hamper cleanup operations and often result in a thorough mixing of oil and water, forming an emulsion which impedes oil removal and allows oil to penetrate to greater depths in the water column.

(3) Location of Spill

One of the most important factors which influences the amount of damage done by an oil spill is the geographic location of the spill. Can the spilled oil reach the shoreline? A spill which occurs in open water at sea will do less damage to the environment than the same spill in a shallow bay where larger numbers of birds, fish, etc., would be exposed. All oil, if it remains at sea long enough, will dissipate through natural processes.

(4) Interaction with the Shoreline

The most harmful effects of an open-water oil spill occur if the slick reaches land. Once oil contacts a coastline, its distribution and persistence are governed by a number of factors that include chemical and physical dispersion processes affecting the oil, the natural degradation of the oil, and other environmental factors. Most important is the level of kinetic energy of the shorefront which determines the abrasion and sediment scouring that occurs from wave activity. Other factors contributing to the breakup of the stranded slick include the tidal cycle and stage of the area, the amount of oil stranded, the grain size of the beach sediment, and the effects of rain that might occur soon after the arrival of the oil slick. Rain and the sediment grain size contribute to the penetration of the oil into the ground.

Table IV-22 outlines significant physical factors influencing how long oil remains stranded on a shorefront. These include the type of oil, the thickness of oil on the shore surface, the depth of oil penetration, the wave energy level at the shoreline, and the air temperature. Oil coming ashore during unusually high tides or storm surges can have a particularly long-term impact on the beaches because it is deposited above normal wave activity.

Table IV-22

Relative Significance of Some Factors that Determine
the Persistence of Oil Stranded on the Shoreline

(From: Owens, E.H., 1979 "Prince Edward Island: Coastal Environments and
the Cleanup of Oil Spills. Environment Canada")

Types of Oil	Thickness of Oil on Shore Surface	Depth of Oil Penetration	Wave Energy Level at Shoreline	Air Temperature	
Light	Very Thin	Most oil exposed	High energy:	High	↓ INCREASING PERSISTENCE
↓	(< 1.0 cm)	on shore surface	Exposed coast	(> 25°C)	
↓	↓	↓	↓	↓	
Heavy	Thick	Most oil buried	Low energy:	Low	
	(10.0 cm)	below beach surface	Protected coast	(0°C)	

Source: Tortell, 1981, p. 20.

(5) RPI's Environmental Sensitivity Index

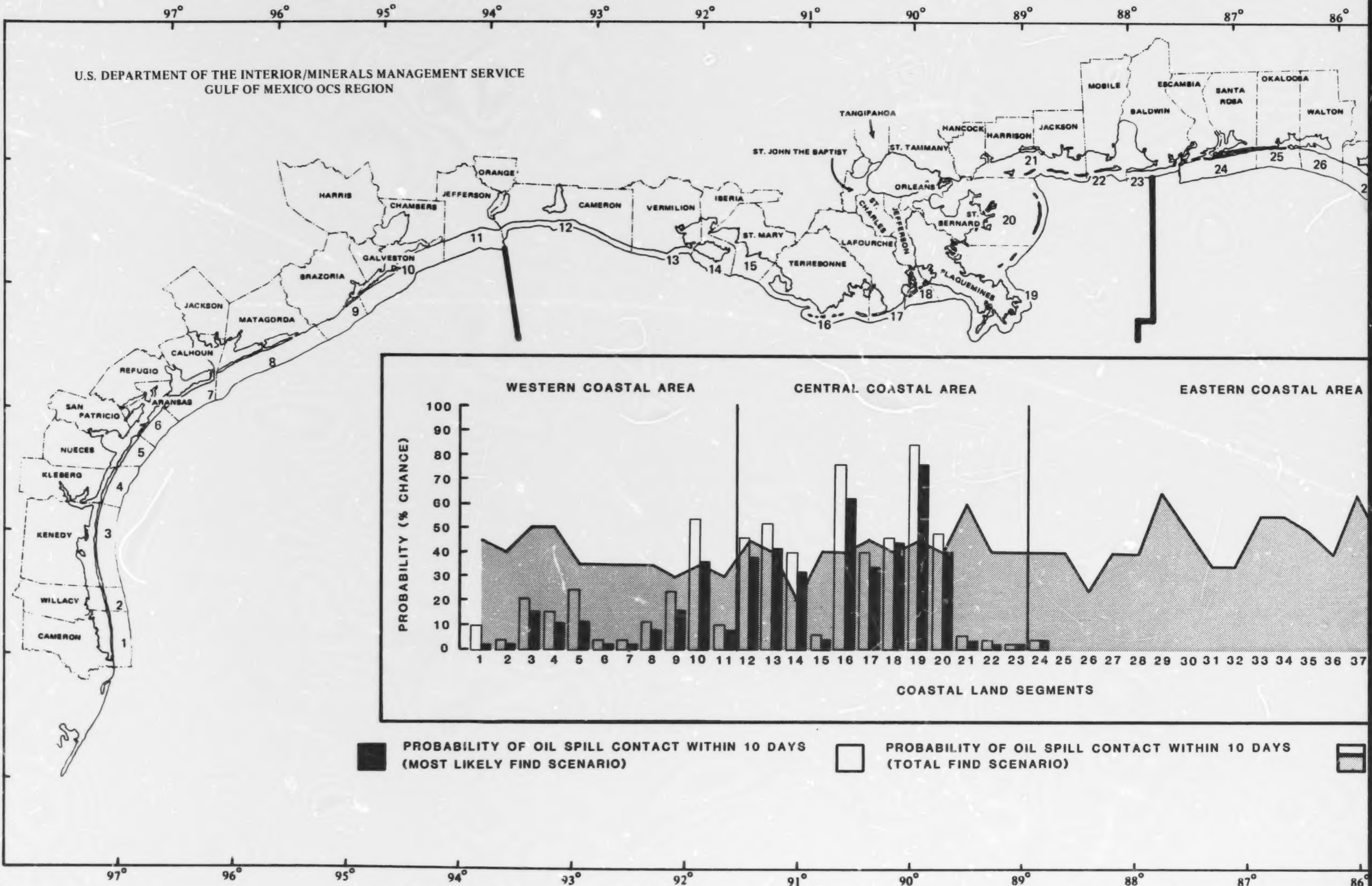
Scientists of the Research Planning Institute, Inc. (RPI) have developed a system which characterizes and ranks geomorphic coastline types with respect to the potential and relative susceptibility to oil spill impact. Vegetation characteristics, shoreline energy regimes, substrate textures that affect depth of oil burial, and other relevant geomorphic features are categorized in order to develop an environmental sensitivity index (ESI). This ESI qualifies the potential long-term persistence and environmental damage of oil on coastline types.

The ESI ranks sheltered mangrove forests and salt marshes highest; that is, most susceptible to oil spill impact of the 10 categories of coastal types (RPI, 1980). Factors brought out by this classification include: (a) the depth of oil burial and the thickness of oil sediment increases as the grain size coarsens; (b) oil can be buried by rapid changes in beach morphology due to natural beach cycles of erosion and deposition or migrating beach cusps; and (c) fine-grained beaches are far more conducive to the mechanical removal of spilled oil than are coarse grained beaches.

RPI has recently completed a detailed coastal resource sensitivity evaluation of the Gulf of Mexico shoreline and developed strategic planning profiles to minimize the impact from oil spills for the Marine Industry Research Group. This is discussed in more detail in Section IV.B.6. For a more detailed discussion of some of these factors, see Volume 1, Section IV.B.3.d. of the Final Regional EIS.

7. Comparison of Vulnerable Resources and Oil Spill Contact Probabilities by Coastal Land Segment

The types and amounts of resources that are both sensitive and vulnerable (exposed) to oil spill contacts, and the probability of an oil spill occurrence and contact with each of the 43 coastal land segments, varies considerably. This analysis compares the relative amounts of important resources (eight categories of sensitive and vulnerable resources have been selected for analysis) and the probability (percent chance) of spill contacts for each coastal land segment (Table IV-23 and Figure IV-4). The level of risk for a coastal land segment is the result of these two independent factors plus the relative degree of sensitivity of the affected resources to oil. This last factor is not considered in this analysis but is discussed in Section IV.B.6.d.


U.S. DEPARTMENT OF THE INTERIOR/MINERALS MANAGEMENT SERVICE
GULF OF MEXICO OCS REGION
97° 96° 95° 94° 93° 92° 91° 90° 89° 88° 87° 86°
30° 29° 28° 27° 26° 25°
HARRIS
CHAMBERS
JEFFERSON
ORANGE
CAMERON
VERMILION
IBERIA
ST. MARY
TERREBONNE
LAFOURCHE
ST. CHARLES
JEFFERSON
ST. JOHN THE BAPTIST
TANGIPAHOA
ST. TAMMANY
ORLEANS
ST. BERNARD
PLAQUEMINES
HANCOCK
HARRISON
JACKSON
MOBILE
BALDWIN
ESCAMBIA
SANTA ROSA
OKALOOSA
WALTON
GALVESTON
BRAZORIA
MATAGORDA
JACKSON
CALHOUN
REFUGIO
ARANSAS
SAN PATRICIO
NUECES
KLEBERG
KENEDY
WILLACY
CAMERON
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
WESTERN COASTAL AREA
CENTRAL COASTAL AREA
EASTERN COASTAL AREA
PROBABILITY (% CHANCE)
0 10 20 30 40 50 60 70 80 90 100
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37
COASTAL LAND SEGMENTS
PROBABILITY OF OIL SPILL CONTACT WITHIN 10 DAYS (MOST LIKELY FIND SCENARIO)
PROBABILITY OF OIL SPILL CONTACT WITHIN 10 DAYS (TOTAL FIND SCENARIO)

COMPARISION OF RESOURCES AND SPILL CONTACT PROBABILITIES BY COASTAL LAND

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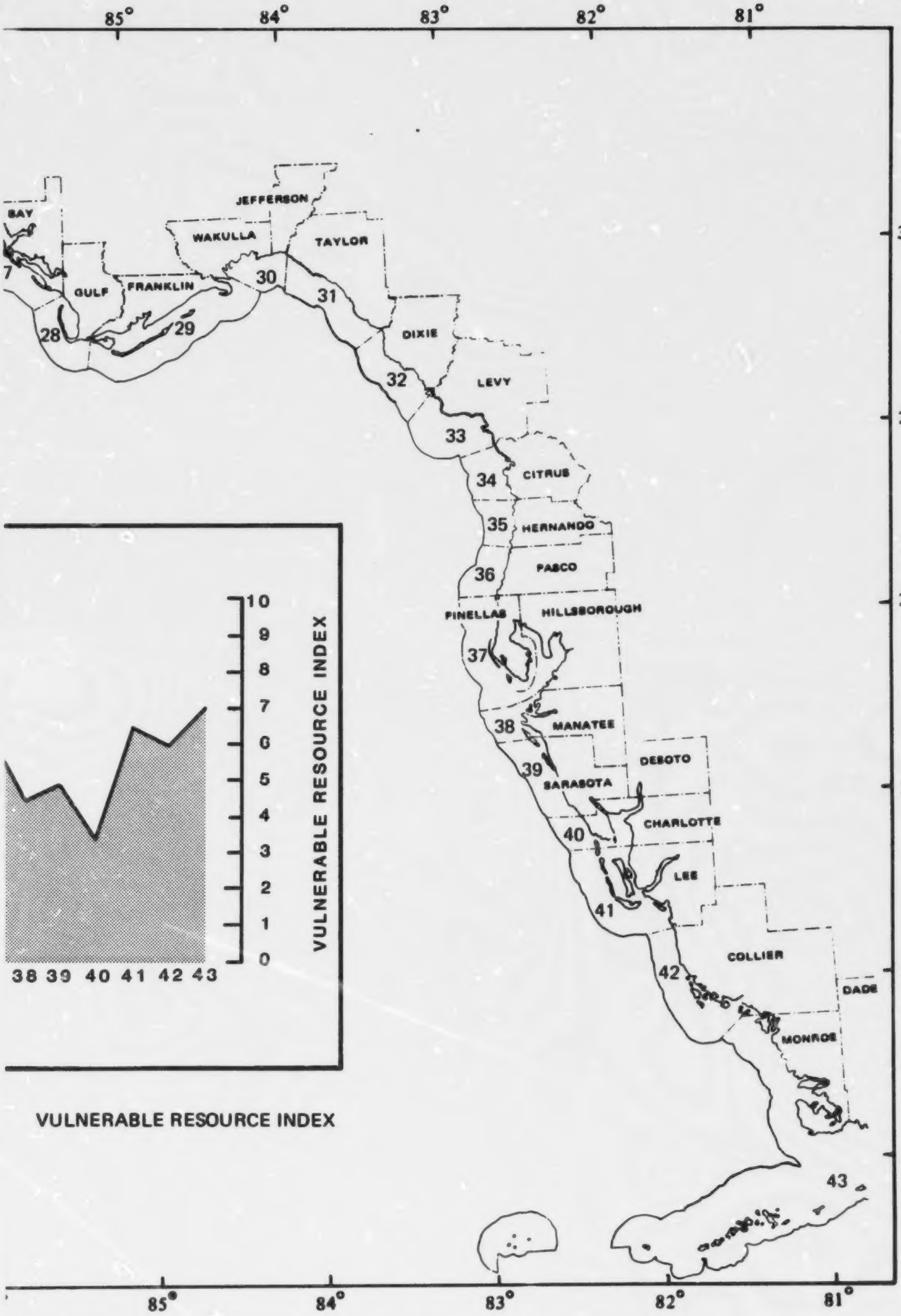
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DIXIE
LEVY
CITRUS
HERNANDO
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PINELLAS
HILLSBOROUGH
MANATEE
DESOTO
SARASOTA
CHARLOTTE
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DADE
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VULNERABLE RESOURCE INDEX
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38 39 40 41 42 43
SEGMENT

VULNERABLE RESOURCE INDEX

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Figure IV-4.

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Table IV-23

A Comparison of the Relative Amounts of Vulnerable Resources and the Probability of OCS-related Oil Spill Contacts by Coastal Land Segment

Relative Amount of Sensitive Vulnerable Resources[1]

Coastal Land Segments[5]	Forested Wetlands A.	Non-Forested Wetlands B.	Mangroves C.	Designated Environmental Preservation Areas D.	Major Recreational Beaches E.	Archaeological Sites F.	Bird Rookeries G.	Endangered/Threatened Species H.	Resource Index[2] I.	Spill Contact Probabilities (M)[3] J.	Spill Contact Probabilities (T)[4] K.
TEXAS (WCA)											
1 Cameron	0	1	0	0	2	2	3	3	4.5	2	9
2 Willacy	0	2	0	0	2	0	3	3	4.0	2	4
3 Kenedy	0	0	0	0	3	3	3	3	5.0	15	20
4 Kleberg	0	0	0	0	3	3	3	3	5.0	9	15
5 Nueces	0	0	0	0	2	1	3	2	3.5	12	24
6 Aransas	0	0	0	0	0	2	3	3	3.5	2	4
7 Calhoun	0	0	0	0	0	2	3	3	3.5	2	4
8 Matagorda	0	2	0	0	0	2	3	3	3.5	8	12
9 Brazoria	0	2	0	0	0	0	3	2	3.0	14	23
10 Galveston/Chambers	0	2	0	0	0	0	3	2	3.5	35	53
11 Jefferson	0	3	0	0	2	0	2	0	3.0	6	8
LOUISIANA (CCA)											
12 Cameron	0	3	0	0	1	2	3	2	4.5	27	45
13 Vermilion	0	3	0	1	0	0	3	2	4.0	41	51
14 Iberia	0	3	0	0	0	0	2	0	2.0	30	39
15 St. Mary	1	3	0	1	1	0	3	0	4.0	3	4
16 Terrebonne	0	3	2	0	0	0	3	2	4.0	62	76
17 Lafourche	0	3	2	0	1	0	3	2	4.5	33	39
18 Jefferson	1	3	0	0	1	0	3	2	4.0	42	46
19 Plaquemines	1	3	0	1	0	1	3	2	4.5	76	84
20 St. Bernard/Orleans/ St. Tammany	0	3	0	1	0	0	3	2	4.0	39	48
MISSISSIPPI (CCA)											
21 Hancock/Harrison/ Jackson	2	2	0	2	3	2	3	0	6.0	4	5
ALABAMA (CCA)											
22 Mobile	1	3	0	0	1	3	2	0	4.0	2	2
23 Baldwin	0	2	0	0	1	2	2	2	4.0	1	1
FLORIDA (ECA)											
24 Escambia/Santa Rosa	0	0	0	1	3	1	2	2	4.0	2	2
25 Okaloosa	0	0	0	0	3	2	2	2	4.0	n	n
26 Walton	0	0	0	0	2	0	2	2	2.5	n	n
27 Bay	0	0	0	2	2	0	3	2	4.0	n	n
28 Gulf	0	0	0	3	2	0	2	2	4.0	1	1
29 Franklin	1	2	0	3	2	2	3	2	6.5	n	n
30 Wakulla/Jefferson	0	3	0	2	0	2	3	2	5.0	n	n
31 Taylor	0	3	0	0	0	0	3	2	3.5	n	n
32 Dixie	1	3	0	0	0	0	2	2	3.5	n	n
33 Levy	1	3	0	3	0	0	3	3	5.5	n	n
34 Citrus	1	2	0	3	0	2	3	2	5.5	n	n
35 Hernando	2	2	0	2	0	0	3	3	5.0	n	n
36 Pasco	2	1	0	1	0	0	3	3	4.0	n	n
37 Hillsborough/Pinellas	2	1	1	2	2	2	3	3	6.5	n	n
38 Manatee	2	0	0	1	2	0	3	3	4.5	n	n
39 Sarasota	0	0	0	1	3	2	3	3	5.0	n	n
40 Charlotte	0	0	0	0	2	0	3	3	3.5	n	n
41 Lee	1	0	2	2	2	3	3	3	6.5	n	n
42 Collier	1	0	3	1	1	2	3	3	6.0	n	n
43 Monroe/Dade	2	1	2	2	2	2	3	3	7.0	n	n

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[1] Numerical values represent relative amount/extent of resources as follows: 1 (low); 2 (moderate); and 3 (high).

[2] Resource index indicates the aggregate amount of resources on a scale of 1-10, with 10 indicating the maximum amount/extent of all eight resources in the land segment.

[3] Probabilities (expressed as percent chance) of one or more spills, and the expected number of spills (mean) occurring and contacting land segments over the expected production life of the lease area, Western and Central Gulf most likely find scenario.

[4] Probabilities (expressed as percent chance) of one or more spills, and the expected number of spills (mean) occurring and contacting land segments over the expected production life of the lease area, Western and Central Gulf total find scenario.

[5] Figure IV-4 provides a map showing the location of the coastal land segments and a graphic plot of the data contained in Columns I, J, and K.

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Table IV-23 indicates the relative amount or extent of each of the eight selected resources (Columns A-H) and the aggregate or total amount of the resources (represented by the index value shown in Column I). The probability (indicated as percent chance) of spill contacts of 1,000 bbls or greater within 10 days under the M Scenario and T Scenario are shown in Columns J and K, respectively. The numerical values shown in Columns A-H of Table IV-23 are based on the amount/extent of the selected vulnerable resource in each land segment. A comparative numerical value of 1, 2, or 3 indicating a low, moderate, or high amount/extent, respectively, was determined for each of the 8 selected resource categories for all 43 of the coastal land segments.

Forested wetlands, nonforested wetlands, mangroves, designated environmental preservation areas, and major recreational beaches were assigned numerical values representing the extent of the resource within the land segment--the greater the percentage of exposed coastline consisting of the particular resource, the higher the value. Archaeological sites were assigned a value based upon the number of vulnerable sites along the exposed portion of the segment. Bird rookery values reflect whether or not rookeries exist in a segment, if they are inshore or coastal, and if they involve birds that are considered endangered. Endangered/threatened species were rated based on the number of endangered/threatened species in a segment and the percentage of the exposed coastline made up of their habitat. The values assigned to all of the individual resources within each coastal land segment were totalled and an index value based on the percentage of the total possible sum was established for each segment. The index values are expressed on a scale 1-10 with 10 indicating a high amount/extent of all eight resources in the land segment.

Results

The Gulf coast environment is such that all the land segments contain important resources in significant quantities. Figure IV-4 and Table IV-23 illustrate that there is a moderate variation in the vulnerable resources index values of most coastal land segments. Thirty of the 43 segments have index values in the 3.0-5.0 point range.

The land segments in the WCA (segments 1-11) have an average index value of 38. The segments along the south Texas coast area rated slightly higher than those to the north, but they also have the lowest probability of oil contact. Most of the proven oil reserves on the OCS are located offshore Louisiana and the northeastern portion of the Texas coast. The oil spill model reflects this fact, indicating higher probabilities of spill contact in the northeastern Texas land segments (8-11).

The CCA has an average index value of 3.4. The land segments from the Texas border to the Mississippi Delta (segments 12-18) all have index values in the 3.0-4.5 point range with the exception of segment 14 which has a value of 2.0. These seven segments have the highest probabilities of spill contact. Their proximity to one of the world's most developed oil producing areas is the primary factor resulting in the high probabilities. (A generalized view of the extent and location of this development is shown on Visual No. 7.) Segment 15 has a much lower probability of contact than the others due to currents (resulting in part from the outflow of the Atchafalaya River) that would serve to deflect a spill away from the area. Of the remaining three land segments in the CCA, segments 20 and 22 have index values of 4.0, well within the average range. Segment 21 with a rating of 6.0 is made up of the entire coast of Mississippi, including most of the environmentally sensitive Mississippi Sound area. The probabilities of oil spill contact are still relatively high in segment 20 but drop significantly in segments 21 and 22 as the distance increases from oil prone areas.

The ECA, with an overall average index value of 51, contains land segments that rank among the highest in the amounts of vulnerable resources, particularly those in the Big Bend, Tampa Bay, and south Florida areas. Segment 24, the nearest ECA county to the proposed sale area, has a very low probability of spill contact while the segments further east and down the Florida Panhandle have virtually no chance of a spill contact.

8. Effects of Catastrophic Oil Spills

The following discussion serves as a worst case analysis of the potential effects of hypothetical catastrophic spills of 100,000 bbls or greater on representative areas of sensitive resources in the Gulf. Section 1502.22 of the CEQ regulations does not require agencies to use a worst case scenario for each species or resource analyzed, and the use of any one scenario (affecting only a single species) would leave questions as the effects of such a worst case scenario on other species or resources. To resolve this problem, the possible effects are analyzed on each resource of concern in selected representative target areas. Where essential information is missing, reasonable projections are made of the worst case with respect to the species or resources.

Two areas were chosen for this analysis, and two counties/parishes were selected based on the diversity of exposed sensitive resources considered representative of their particular regions. The selected areas are considered to be affected by a hypothetical spill with characteristics identified in the following scenario.

Table IV-24 provides the available quantification of the sensitive resources in Lafourche Parish and Galveston County which are analyzed.

Table IV-24

Exposed Sensitive Resources in Selected Catastrophic Spill Targets

County/Parish	Linear Extent Miles	Percent of Total Exposed Coastline	Acreage
Lafourche Parish, Louisiana			
Total Exposed Coastline	122.6		
Major Shorefront Recreational Beaches	7.6	6.2%	
Wetlands	89.9	72.7%	477,427
Mangroves	22.1	18.1%	2,000
Seagrass Beds			2,326
Galveston County, Texas			
Total Exposed Coastline	139.4		
Major Shorefront Recreational Beaches	47.5	34%	
Wetlands	54	38.7%	6,310

Approximately 100,000 bbls or greater of Louisiana crude are released within close proximity to the selected target. Weather conditions hamper cleanup activities and the oil is rapidly washed ashore, contacting the coastline within hours and affecting the entire length of the exposed portion of the county/parish (shown on Visual No. 14) within the first three days after its release.

The history of major oil spills in the Gulf indicates that the average size oil spill is about 17,000 bbls (Section IV.B.6.a.), which is the typical size spill analyzed in the sections of this document pertaining to the potential impacts resulting from the proposed action.

Impacts on a Representative Central Gulf Area

Lafourche Parish, Louisiana, was selected as the target for the CPA. It contains a high diversity of sensitive resources representative of much of the coastline of the area.

Lafourche Parish is located west of the Mississippi River and is part of the Mississippi Deltaic Plain Region. The shoreline of the parish fronts on the open Gulf to the south and on estuaries to the east and west. The predominant features of the shoreline are the numerous small bays and inlets to the saline marsh which is generally exposed to Gulf seawater. The shoreline also includes marsh and barrier islands. The marsh islands lie within the estuaries behind the barrier islands. The Gulf front portions of the barrier islands and the mainland marsh are often made up of beach ridges, some of which serve as recreational beaches. The areas behind these ridges are protected from the full force of the open Gulf by the energy-absorbing characteristics of the beaches.

Most of the coastal area of the parish provides valuable habitat for coastal and marine birds and furbearing animals. The wetlands and the estauries are also very important to the recreational and commercial fisheries of the south Louisiana area.

Sensitive Coastal Habitats (Wetland): Sensitive coastal habitats in Lafourche Parish consist of non-forested wetlands (354,915 acres), forested wetlands (122,512 acres), mangroves (2,000 acres), and seagrass beds (2,325 acres). Within these habitats there are no forested wetlands, 88.9 linear miles of non-forested wetlands, 22.1 linear miles of mangroves, and 2,320 acres of seagrass beds exposed if an oil spill occurred. It is assumed that the spill would contact the Gulfward fringe of the mangroves and non-forested wetlands, and it would be evenly dispersed over the seagrass beds.

The impact along the Gulfward fringe of the habitat is estimated to range from complete mortality to reduction in growth throughout the duration of the spill for emergent plants in non-forested wetlands. No forested wetlands are exposed; consequently, no impact is expected. Impacts to mangroves is expected to range from complete mortality to reduction in growth for plants contacted. Seagrass beds are expected to experience reduction in growth for most species, and mortality of invertebrates and larval vertebrates is expected. Recovery of the impacted areas to pre-spill conditions could take several years.

Water Quality: In general, a catastrophic oil spill of 100,000 bbls would likely result in substantial adverse impacts on water quality. Occurrences of very large oil spills have been described in the cases of Ixtoc I (wellhead blowout/3.1 million bbls), Bravo (surface platform blowout/175,000 bbls), Argo Merchant (tanker accident/180,000 bbls) and Amoco Cadiz (tanker accident/1.5 million bbls). Under such a catastrophic oil spill scenario, the oil would be rapidly released and widely dispersed by the action of wind and currents, resulting in the transport of oil to shallow, coastal water bodies. Although some of the oil released would be distributed throughout the water column in the vicinity of the wellhead in the case of a blowout and probably a very large surface water area would be covered by floating oil, it is the oil reaching the relatively shallow (197 ft) coastal areas and embayments that would cause the most severe water quality impacts. In the shallow areas, oil might be initially dispersed throughout the water column and might also become entrained in suspended particles and bottom sediments, subsequently being reintroduced into the water column as a result of tide, wind, or current action. Thus, elevated hydrocarbon levels may result in the water column for an extended period of time. Furthermore, although stormy conditions would likely enhance the break-up and dispersion of the spilled oil, they would also impede spill cleanup procedures. For a more indepth discussion on "Oil in the Water Column," see Section IV.B.6.

Air Quality: Assuming the most severe climatic conditions, potential impacts on air quality affecting the human environment over Lafourche Parish could be high in the event of a 100,000 bbl oil spill occurring and contacting the coastal area. Emissions due to evaporation of total hydrocarbons (THC) would be approximately 2,850 tons the first hour and 1,450 tons the second hour. Over a 10-day period at least 45% of this spill would evaporate at a decreasing hourly rate. The result of these emissions would be to place in the atmosphere a large number of volatile organic compounds (VOC). These compounds are a constituent in the formation of photochemical oxidants (Ox) known as ozone.

Lafourche Parish presently exceeds national air quality standards for Ox. The addition of emissions from a major oil spill under stagnate air/long sunny day conditions could create poor air quality (smog) for an indeterminate period of time. The intensity and duration of poor air quality would be controlled by wind direction, wind speed, the season of the year, and the amount of sunshine present during evaporative emissions. Conditions creating smog are rarely present for periods exceeding 24 hours due to variable coastal winds and the relatively flat terrain of Lafourche Parish; however, the potential for high air quality impacts exist as a result of a major oil spill.

Endangered and Threatened Species: Impacts on endangered and threatened species would occur when the oil spill reached nearshore and coastal areas of Lafourche Parish.

Bald eagles and brown pelicans occur in this area. These endangered bird species could become fouled with oil while feeding in the coastal area. The adult birds could die from oil fouling or could transfer the oil contamination to their eggs or young, resulting in population losses. Moderate losses of these endangered birds could occur if the oil spill was widespread on the surface of the water and extended over a 1-2 week duration.

A large oil spill in this area could result in a major impact on endangered and threatened sea turtles. Both loggerhead and ridley turtles feed in these nearshore waters; no recent turtle nesting has been reported for this area. The oil contamination could disorient and/or asphyxiate adult turtles and/or impact feeding activities and food sources.

It is unlikely that American alligators would be directly impacted by an oil spill in this area, as their habitat is more inshore than coastal. However, they could ingest oil-contaminated animals, which could result in a very low population loss.

A catastrophic oil spill in this area is unlikely to result in a major impact to endangered marine mammals because few occur or feed in this nearshore area. However, there could be a moderate impact to non-endangered cetaceans (bottlenose dolphins).

Coastal and Marine Birds: The coastal wetlands of Lafourche Parish, Louisiana, provide an important habitat for several species of overwintering waterfowl. The area is also habitat for a number of herons, egrets, gulls, terns, rails, plovers, and other shorebirds, many of which are overwintering species. There are several nesting colonies of wading birds (i.e., egrets and herons), and Forsters and least terns nest on exposed beach areas.

It is likely that large numbers of overwintering waterfowl, migrating shorebirds, and other bird species could be fouled with oil and die if an oil spill occurred in early spring prior to/during the spring migration period. Breeding and nesting adult birds could become contaminated with oil while feeding in coastal waters or along the shore, and/or could ingest oil-contaminated food. Nesting areas are generally located above high tide and may not be affected, but feeding occurs offshore, nearshore, or in tidally influenced coastal areas. If the spilled oil contaminated coastal bottom sediments, feeding areas could be contaminated for several years. As a result, breeding and feeding areas in the coastal areas of Lafourche Parish, Louisiana, may not support coastal and marine bird populations for 2-5 years and local bird populations could be severely depressed in variety and numbers.

Commercial Fishing Industry: A catastrophic oil spill would have a major impact on the oyster, shrimp, and blue crab fisheries in Lafourche Parish, Louisiana. Lafourche Parish contains oyster seed ground reservations and private oyster lease areas. The bays and estuaries within Lafourche Parish provide nursery areas for shrimp and blue crab. The total marine commercial fisheries landings in Lafourche Parish for 1983 was 14,798,689 lbs worth $21,416,990 (Table IV-25). The total oyster, shrimp, and blue crab landings in Lafourche Parish for 1983 were 929,882 lbs worth $1,362,606; 9,275,909 lbs worth $17,598,109; and 2,377,020 lbs worth $706,806, respectively (Table IV-25). The total oyster, shrimp, and blue crab landings in Louisiana for 1983 were 13,229,377 lbs worth $17,621,237; 76,953,758 lbs worth $130,911,626; and 19,616,001 lbs worth $6,366,172, respectively (Table IV-25). There would be a loss of at least $1,362,606, $706,806, and $17,598,109 worth of oysters, blue crab, and shrimp, respectively.

Table IV-25

Lafourche Parish Landings for 1983

Lafourche Parish 1983	Pounds	Dollars
Total Marine Commercial Fisheries Landing	14,798,689	21,416,990
Total Oyster Landings	929,882	1,362,606
Total Shrimp Landings	9,275,909	17,598,109
Total Blue Crab Landings	2,377,020	706,806
State of Louisiana 1983		
Total Oyster Landings	13,229,377	17,621,237
Total Shrimp Landings	76,953,758	130,911,626
Total Blue Crab Landings	19,616,001	6,366,172

Source: National Marine Fisheries Service, Personal communication, 1985.

Major Shorefront Recreational Beaches: The shorefront of Lafourche Parish is characterized by 14 miles of sandy beach shorefront; however, there are no designated parks or recreational support facilities encouraging public recreation of these beaches. About six miles of barrier island beach is isolated from the mainland on East Timbalier Island, while eight miles of beach at Elmers Island and Fourchon Beach is partially accessible and receives a great deal of recreational use. These beaches attract almost exclusively day use and campers interested in Gulf fishing and crabbing. A major oil spill as described would remove this eight miles of recreational beach from fishermen and crabbers for one week to 60 days depending on currents, tides, weather, access, and cleanup effectiveness. The greatest impact on recreational use of this beach would occur if this spill beached during the spring and summer months when the crab and speckled trout runs are in progress. After the spill has been cleaned and the beaches returned to prespill conditions, use and enjoyment of Lafourche Parish beaches is likely to return to normal.

Cultural Resources: Should a catastrophic oil spill occur and contact a coastal historic or prehistoric site, the impacts on both historic and prehistoric archaeological sites would be the same as those discussed under Section IV.D.1.a.(11). Since the risk of a catastrophic oil spill occurring would be low, the expected impacts to historic and prehistoric sites would be the same as those discussed under Section IV.D.1.a.(11).

Tourist Activity/Industry: The discussion of impacts on major shorefront recreational beaches is also relevant to tourism beaches (which are virtually synonomous with recreational beaches) along the Gulf shoreline. The emphasis of the tourism analysis differs from the recreation sector, however, by concentrating on travelers who are generally more than 100 miles from their residences. The net effects of oil spills on tourism are based on associated projections of reduced tourism expenditures on food, lodging, and automotive services.

Estimates of expected losses to tourism are based on the assumption that one catastrophic spill would occur at the peak of the tourist season and would eliminate all tourism at beaches for the entire peak season. The net effects of changes in tourism are considered very high if the changes exceed 20% of total tourism expenditures, high if the changes represent 16%-20%, moderate at 11%-15%, low at 6%-10%, and very low at 5% or less.

Average annual tourism losses from a catastrophic spill in Lafourche Parish are presented in Table IV-26. These estimates are based on the assumption that all travel expenditures ($17.2 million in 1982) are related to tourism, but that only 1% of the tourism is beach-related and that no more than 50% of the tourism would occur during the peak season.

The net effect, a loss of $86,000, amounting to 0.5% of the tourism expenditures, is considered very low.

Table IV-26

Expected Average Annual Beach-Related Tourism Losses
Catastrophic Oil Spill Analysis

Area of Impact	Annual Tourism Receipts Dollars (millions)	Average Annual Losses[1] Dollars (millions)	 Percent[2]
Central Gulf			
Lafourche Parish, Louisiana	17.2 (1982)	0.086	0.5
Western Gulf			
Galveston County, Texas	211.7 (1983)	52.396	24.8

[1] Losses are based on the assumption that one catastrophic spill would eliminate all tourism at at beaches for the peak season. [2] Percent figures represent proportions of total tourism receipts in the coastal region (beach and non-beach related) in 1983.

Impacts on a Representative Western Gulf Area

Galveston County, Texas, was selected for the WPA. It contains a high diversity of sensitive resources representative of much of the coastline of the area.

Galveston County is located southeast of Houston, Texas, with shoreline fronting on both Galveston Bay and the open waters of the Gulf of Mexico. The Galveston Bay portion of the shoreline is protected from the full force of the open Gulf by Galveston Island and Bolivar Peninsula. The Bay front shoreline consists predominantly of wetlands and developed areas, while the Gulf front shoreline is typically sand beach with areas that are considered to be major recreational beaches.

Much of the Galveston County area provides valuable habitat for coastal and marine birds and Galveston Bay supports the largest oyster, blue crab, and shrimp fishery in the State of Texas.

Table IV-24 provides the available quantification of the sensitive resources in Galveston County which are analyzed below.

Sensitive Coastal Habitats (Wetlands): Sensitive coastal habitats of Galveston County consist of non-forested wetlands (68,310 acres) and seagrass beds (4,787 acres). Within these habitats there are 54 linear miles of non-forested wetlands and no seagrass beds exposed if an oil spill occurred.

The impact along the Gulfward fringe of the habitat is estimated to range from complete mortality to reduction in growth throughout the duration of the spill for emergent plants. Recovery of impacted areas to prespill conditions could take several years.

Water Quality: In general, a catastrophic oil spill of 100,000 bbls would likely result in substantial adverse impacts on water quality. Occurrences of very large oil spills have been described in the cases of Ixtoc I (wellhead blowout/3.1 million bbls), Bravo (surface platform blowout/175,000 bbls), Argo Merchant (tanker accident/180,000 bbls) and Amoco Cadiz (tanker accident/1.5 million bbls). Under such a catastrophic oil spill scenario, the oil would be rapidly released and widely dispersed by the action of wind and currents, resulting in the transport of oil to shallow, coastal water bodies. Although some of the oil released would be distributed throughout the water column in the vicinity of the wellhead in the case of a blowout and probably a very large surface water area would be covered by floating oil, it is the oil reaching the relatively shallow (197 ft) coastal areas and embayments that would cause the most severe water quality impacts. In the shallow areas, oil might be initially dispersed throughout the water column and might also become entrained in suspended particles and bottom sediments, subsequently being reintroduced into the water column as a result of tide, wind, or current action. Thus, elevated hydrocarbon levels may result in the water column for an extended period of time. Furthermore, although stormy conditions would likely enhance the break-up and dispersion of the spilled oil, they would also impede spill cleanup procedures. For a more indepth discussion on "Oil in the Water Column," see Section IV.B.6.

Air Quality: Assuming the most severe climatic conditions, potential impacts on air quality affecting the human environment over Galveston County could be high in the event of a 100,000 bbl oil spill occurring and contacting the coastal area. Emissions due to evaporation of THC would be 2,850 tons the first hour and 1,450 tons the second hour. Over a 10-day period at least 45% of this spill would evaporate at a decreasing hourly rate. The result of these emissions would be to place in the atmosphere a large number of volatile organic compounds (VOC). These compounds are a constituent in the formation of photochemical oxidants (Ox) known as ozone.

Galveston County presently exceeds national air quality standards for Ox. The addition of emissions from a major oil spill under stagnate air/long sunny day conditions could create poor air quality (smog) for an indeterminate period of time. The intensity and duration of poor air quality would be controlled by wind direction, wind speed, the season of the year, and the amount of sunshine present during evaporative emissions. Conditions creating smog are rarely present for periods exceeding 24 hours due to variable coastal winds and the relatively flat terrain of Galveston County; however, the potential for high air quality impacts exist as a result of a major oil spill.

Endangered and Threatened Species: Impacts on endangered and threatened species would occur when the oil spill reached nearshore and coastal areas of Galveston County, Texas.

Overwintering or migrating bald eagles and peregrine falcons possibly occur in this area. These endangered bird species could become fouled with oil while feeding in the coastal area. The adult birds could die from oil fouling or could transfer the oil contamination to their eggs or young, resulting in population losses. Moderate losses of these endangered birds could occur if the oil spill was widespread on the surface of the water and continued over a 1-2 week duration, and their prey species become contaminated with oil.

A large oil spill in this area could result in a major impact on endangered and threatened sea turtles. Both loggerhead and ridley turtles feed in these nearshore waters. No recent turtle nesting has been reported for this area. The oil contamination could disorient and/or asphyxiate adult turtles and/or impact feeding activities and food sources. An extensive oil spill in this sea turtle feeding habitat could result in a high impact to leatherback, loggerhead, and ridley sea turtles.

It is unlikely that American alligators would be directly impacted by a major oil spill in this area, as their habitat is more inshore than coastal. However, they could ingest oil contaminated animals, which could result in a very low population loss.

A catastrophic oil spill in this area is unlikely to result in a major impact to endangered marine mammals because few occur in this nearshore area. However, there could be a moderate impact to non-endangered cetaceans (bottlenose dolphins).

It is unlikely that red wolves at the Anahuac National Wildlife Refuge would be directly impacted by a major oil spill in this area, as their habitat is more inshore that coastal. However, they could ingest oil contaminated animals, which could result in a negligible population loss.

Coastal and Marine Birds: The coastal wetlands of Galveston County, Texas, provide an important habitat for about 25 species of overwintering waterfowl and shorebirds. The area is also habitat for a number of heron, egret, ibis, gull, and tern species, many of which overwinter in the area. There are several nesting colonies of wading birds (i.e., egrets, herons, and ibis), and Forster's, caspian, and least terns nest in beach areas.

It is likely that large numbers of overwintering waterfowl, migrating shorebirds, and other bird species could be fouled with oil and die if an oil spill occurred during the fall/winter overwintering period or spring through fall for nesting birds. Breeding and nesting adult birds could become contaminated with oil while feeding in coastal waters or along the shore and/or could ingest oil-contaminated food. Nesting areas are generally above high tide and may not be affected, but feeding occurs offshore, nearshore, or in tidally influenced coastal areas. If the spilled oil contaminated coastal bottom sediments, feeding areas could be contaminated for several years. As a result, breeding and feeding areas in the coastal area of Galveston County, Texas, may not support coastal and marine bird populations for 2-5 years, and local bird populations could be severely depressed in variety and numbers.

Commercial Fishing Industry: A catastrophic oil spill would have a major impact on the oyster, shrimp, and blue crab fisheries in Galveston County, Texas. Bryan (1981) reports that about 80% of the oyster production in Texas comes from the Galveston Bay system. The bays and estuaries within Galveston County provide nursery areas for shrimp and blue crab. The total marine commercial fisheries landings in Galveston County for 1982 was 6,377,600 lbs worth $11,099,246 (Table IV-27). The total oyster, shrimp, and blue crab landings in Galveston County for 1982 were 1,615,700 lbs worth $2,289,398; 3,862,300 lbs worth $8,341,584; and 471,400 lbs worth $167,797, respectively (Table IV-27). The total oyster, shrimp, and blue crab landings in Texas for 1982 were 3,633,200 lbs worth $5,313,726; 41,760,500 lbs worth $97,189,452; and 8,018,700 lbs worth $2,378,416, respectively (Table IV-27). There would be a loss of at least $2,289,398 (45% of the value for Texas), $167,797, and $8,341,584 worth of oysters, blue crab, and shrimp, respectively.

Table IV-27

Galveston County Landings for 1982

Galveston County 1982	Pounds	Dollars
Total Marine Commercial Fisheries Landings	6,377,600	11,099,246
Total Oyster Landings	1,615,700	2,289,398
Total Shrimp Landings	3,862,300	8,341,584
Total Blue Crab Landings	471,400	167,797
State of Texas 1982		
Total Oyster Landings	3,633,200	5,313,726
Total Shrimp Landings	41,760,500	97,189,452
Total Blue Crab Landings	8,018,700	2,378,416

Source: National Marine Fisheries Service, Personal communication, 1985.

Major Shorefront Recreational Beaches: The entire shorefront of Galveston County from Chambers County to Brazoria County consists of barrier island beach. Almost the entire length of Galveston Island, inclusive of East Beach, West Beach, Galveston Island State Park and designated recreational portions of Bolivar Peninsula, constitutes about 50 linear miles of major recreational beaches directly facing the Gulf in Galveston County. A catastrophic oil spill under the scenario described would remove the entire shorefront of Galveston County from recreational use for two weeks to two months depending on currents, tides, weather, access, and cleanup effectiveness. Should such a catastrophy occur during the spring and summer months, the resulting recreational impacts, especially in Galveston Island, would be catastrophic as an entire recreational season would be annihilated. This would cause serious economic implications throughout Galveston County as the community is highly dependent on the viability of its shorefront recreational resource for its economic well being. Although there could be some residual effects on tourism, the recreational aspects of Galveston County should return to normal when the beaches have returned to prespill conditions. Sand removal and replacement is likely to be warranted along the most intensively utilized recreational beaches to expedite the return to normality.

Cultural Resources: Should a catastrophic oil spill occur and contact a coastal historic or prehistoric site, the impacts on both historic and prehistoric archaeological sites would be the same as those discussed under Section IV.D.2.a.(11). Since the risk of a catastrophic oil spill occurring would be low, the expected impacts to historic and prehistoric sites would be the same as those discussed under Section IV.D.2.a.(11).

Tourist Activity/Industry: The discussion of impacts on major shorefront recreational beaches in Texas is also relevant to tourism beaches (which are virtually synonomous with recreational beaches) along the Gulf shoreline. The emphasis of the tourism analysis differs from the recreation sector, however, by concentrating on travelers who are generally more than 100 miles from their residences. The net effects of oil spills on tourism are based on associated projections of reduced tourism expenditures on food, lodging, and automotive services.

Estimates of expected losses to tourism are based on the assumption that one catastrophic spill would occur at the peak of the tourist season and would eliminate all tourism at beaches for the entire peak season. The net effects of changes in tourism are considered very high if the changes exceed 20% of total tourism expenditures, high if the changes represent 16%-20%, moderate at 11%-15%, low at 6%-10%, and very low at 5% or less.

Average annual tourism losses from a catastrophic spill in Galveston County are presented in Table IV-26. These estimates are based on the assumptions that all travel expenditures ($211.7 million in 1983) are related to tourism, that 75% of the toruism is beach-related, and that 33% of the tourism would occur during the peak season.

The net effect, a loss of $52.396 million, represents 24.8% of the annual tourism expenditures and is considered very high.

Although the anticipated level of adverse impact ranges from very high to very low for the different target areas, the probability of such an occurrence is low for the entire Gulf region.

9. Oil Spill Containment/Cleanup Capabilities and Effectiveness

The first line of defense for accidental oil spills is prevention; however, when a spill occurs, rapid decisions must be made on how to best minimize the impacts. Available equipment is of no use without a preplanned approach as to how to use it. Improvements in prespill contingency planning at all levels of government and private industry in past years have reduced confusion and increased the efficiency and effectiveness of cleanup response. By knowing the nature of the spilled material as well as slick dynamics, the characteristics of the threatened environment and the available equipment and manpower, the responsible party can prioritize and evaluate selected actions. The primary thrust of the National Contingency Plan is to provide a Federal response capability at the regional level. The Federal response program established on-scene coordinators (OSC) to direct response for pollution or potential pollution incidents. The OSC notifies the responsible party for the spill of his responsibility and is encouraged to undertake proper countermeasures and mitigate the effect. This includes observing and monitoring progress and providing advice and counsel to the spiller as necessary. In addition, there is a Regional Response Team (RRT) made up of various Federal and State agency representatives which can be convened at the request of an OSC for advice or assistance in obtaining equipment or other support. At the national level the National Response Team (NRT), comprised of representatives of 12 federal agencies, is also available to an OSC for major policy decisions or large-scale and specialized support not available through RRT or local resources. Scientific Support Coordinators are provided by NOAA and USEPA and are available upon the request of the OSC. This unique multi-agency working relationship gives an OSC quick access to equipment, personnel, and expertise needed to deal with situations where commercial assistance is limited or nonexistent.

A group of oil companies involved in petroleum transportation in the Gulf of Mexico has established the Marine Industry Research Group (MIRG). Recently MIRG has funded two oil spill contingency planning information projects which should provide meaningful guidance and information to spill response personnel. The Resources and Logistics Element identifies the location of specific cleanup equipment/resources and provides deployment requirements and specifications. The Environmental Element describes Gulf of Mexico environments, identifies biologically and socioeconomically sensitive areas, and includes countermeasure considerations.

The information is provided in two volumes: Volume 1 is an environmental overview of the Gulf of Mexico, including physical processes influencing the movement of spilled oil, a description of the environment, an analysis of potential spill impacts, and spill considerations for each type of environment. A bibliography of more than 700 citations and references is included. Volume 2 is divided into six sections, each section being a state or group of states (United States and Mexico). Each section includes: overview maps of the regions; detailed maps of each area (1:24,000 scale) within the regions; and facing pages describing important biological resources, reasons for sensitivity, and logistics data such as boat launch sites (Lindstedt-Siva et al., 1983). Sections I.B.5 of this document and IV.B.5. (Volume 1) of the Final Regional EIS present a full discussion on the Federal response program.

a. Equipment Locations

Table IV-28 illustrates oil spill equipment availablility in the Gulf of Mexico area. Each category of Table IV-28 is divided into U.S. Coast Guard Captain-of-the-Port/Marine Safety Office (COPT/MSO) jurisdictions, with the listed cities being the office base for each Coast Guard area. Many of the establishments are located in the cities listed in the table, but others are dispersed in cities/towns throughout the jurisdiction of each COTP/MSO area.

This information and other information concerning the number and locations of cleanup operatives and establishments stocking oil spill cleanup equipment was taken from the computerized Spill Equipment Inventory System (SKIM) of the USCG, revised December 22, 1981; it was also acquired by personal communication with authorized personnel at the COTP/MSO in each area.

The category, "Number of Establishment with Oil Spill Cleanup Equipment on Hand," (Table IV-28) includes all those establishments that maintain a limited number of cleanup equipment in the event of a minor spill as a result of their oil-and gas-related activities, such as a coastal refinery. This equipment is also available to teams cleaning up large spills if the need arises. The figures under the title, "Number of Cleanup Establishments," are those operatives organized for the sole purpose of containment and cleanup of an oil spill. Of these identified cleanup services, several are capable of cleaning up oil spills in the offshore environment, as well as providing the necessary equipment and trained teams to rapidly respond to the removal or containment of oil along the coastline.

Along the WPA coastline, 55 establishments occur which maintain oil spill response equipment; 22 cooperatives, private or government operatives, or contractors exist whose sole purpose is oil spill response, and 6 of these have offshore response capabilities.

In the CPA, the following services are available: 23 establishments have oil spill cleanup equipment, 22 more are designated oil spill response operatives, and 6 of these have offshore oil response capabilities.

b. Equipment Effectiveness

A wide variety of equipment is available to aid in the containment and cleanup of spilled oil. Current designs allow for cleanup operations in various stages. In some situations, however, it has proven beneficial to use cleanup personnel as opposed to mechanical equipment as the tool for cleanup operations. Containment and cleanup operations are labor intensive operations due to the complexity of the environment they are conducted in and the constant monitoring/planning efforts associated with them. Not only are these operations labor intensive, but the personnel must be well-trained in the use of equipment and the methodology of spill containment and cleanup. The most common products used for oil spill control and containment other than, and in addition to, trained personnel are such devices as booms, skimmers, sorbents, spill control chemicals (dispersants), and pumps. (For a detailed discussion on dispersants, see Appendix D.)

Skimmers are those devices designed to remove a layer of oil from the water's surface for disposal. Most skimmers can be classified as weir skimmers (provides gravity drain off to oil), vacuum skimmers (similar to weir, but utilize a power source to actively remove the oil), centrifugal skimmers (where a power source is used to create a vortex that drains the oil into collection), submission skimmers (utilized by vessel by forcing the oil below the water level and

Table IV-28

Availability of Oil Spill Cleanup Equipment

U.S. Coast Guard COTP/MSO Area	Number of Establishments With Oil Spill Cleanup Equipment on Hand[1]	Number of Cleanup Establishments[2]					Grand Total of Establishments
		Contractor	Cooperative	Private	Government	Total	
Corpus Christi	14	2	2	1	2	7	21
Galveston	8	3	0	1	1	5	13
Houston	19	3	1	0	1	5	24
Port Arthur	14	3	1	0	1	5	19
New Orleans	13	3	5	6	1	15	28
Mobile	10	3	1	1	2	7	17
Tampa	4	3	0	4	1	8	12
Miami	2	2	0	0	1	3	5

Sources: [1] Spill Equipment Inventory System, U.S. Coast Guard.
[2] Personal communication with authorized personnel at Captain-of-the-Port/Marine Safety Office (COTP/MSO) in each area identified.

using its buoyant property in the collection process), and oleophillic skimmers (collects oil on a moving sorbent material and mechanically squeezed it into collection areas). Skimmers typically have a recovery rate of up to 300 tons/hour, and skimming speed of approximately 1.5 kts, operable in a sea up to a maximum of 2-3 m and recovery efficiency of around 80%-90% in optimum conditions.

Sorbents are those materials that recover oil through absorption either on the materials' surface or collection of the oil in the materials' pores. Sorbents can generally be classed as natural organic material (cellulose, peat, or straw), synthetic organic substances (polyurethane, polystyrene, and rubber), and mineral-based compounds (ash, vermiculite, and perlite). They are also available in various sizes and shapes for particular usage requirements and they are available in rolls, sweeps, sheets, particulates, pillows, and booms.

Pumps are used in oil spill cleanup operations to transfer collected oil from a collecting device, such as a boom, to a vessel or facility for separation, reprocessing storage, or transportation to other facilities. Although specifications of the various pumps available are not relevant to this discussion, it should be recognized that these are fundamentally necessary equipment for cleanup operations.

Offshore containment/cleanup operations are major tasks requiring significant coordination and cooperation, transportation of large equipment, vessel support, aircraft support, set-up and maintenance of a command/coordination post in the field, and properly staged and available equipment. Often, the weather/sea conditions and crew fatigue become the critical factors during these operations. As the seas approach heights in excess of 5 ft, these operations become increasingly more dangerous and ineffective. The effectiveness of offshore containment/cleanup operations is, in general, marginally effective. It is possible, however, to contain a platform spill if environmental and logistical conditions are right. The effectiveness of this type of containment and cleanup operation is estimated to be approximately 5%-15% recovery.

Inshore containment/cleanup operations can be either large scale or moderately sized operations depending on any particular spill situation. Again, if the task becomes large it requires the same level of coordination and support as an offshore operation.

The Coast Guard's Gulf Strike Team has an Open Water Oil Containment and Recovery System (OWOCRS) which is a system capable of removing oil in seas to 5 ft and surviving a 10-ft sea. The OWOCRS is 612 ft long with a draft of 32" and a freeboard of 16" supported by 102 CO_2 inflatable flotation buoys. A pump sled recovers oil via six weirs located in the middle of the boom, discharging collected oil into an appropriate holding area at a rate of up to 825 gallons/minute. It should be noted that deployment and operation of the OWOCRS system is a large-scale operation requiring proper staging equipment, transportation, and logistics planning. Two vessels and a collection barge must be available for system operations. The USCG Strike Team has a variety of other support equipment at their disposal, as well as personnel that are well-trained in handling this equipment.

Clean Gulf Associates' (CGA) faster response open sea and bay skimmer is a portable system, utilized by mounting on a work boat approximately 100 ft in length. This system is designed as a low-volume recovery system capable of 190 bbls recovery; however, the tanks can be pumped to waiting barges if necessary. Maximum skimming speed is about 3/4 kts. This system is compact enough to be stored offshore on mobile drilling rigs for fast response. In addition, CGA has available a high volume open sea skimmer system; shallow water skimmer system; dispersant spray systems for boats, helicopters, and fixed wing aircraft; incinerator; radio communication system, mechanical bird scarers, a waterfowl rehabilitation station; and biological and chemical sampling equipment.

The high-volume open sea skimmer is designed for open sea skimming in sea conditions up to 5 ft with currents up to 1 kt relative to the skimmer with maximum efficiency being obtained n the stationary mode anchored down current from a spill. Its usefulness in chasing spilled oil is limited and not recomended. The system contains two 512' x 72" booms with additional lengths of boom available.

The shallow water skimming system is a self-contained shallow water skimming vessel approximately 36 ft in length. Operations are limited to skimming in seas to 2 ft with a maximum skimming speed of one knot and total holding capacity of 34 bbls of skimmed material on board.

Auxiliary storage barges with a 50-bbl capacity are available for additional storage.

The effectiveness of a containment/cleanup operation in an inshore area largely depends on the unique physical characteristics of the environment and the area of the operation. The range of effectiveness is from marginally successful to successful.

c. Recent Important Accidents

The following information is presented to describe the occurrence and environmental impact of oil spills that have occurred recently in the Gulf of Mexico and associated environs. Description of the actual environmental impact is presented as a record as opposed to predicted impacts.

Horn Island Spill, MS: The Horn Island Spill was of unknown origin and resulted in the discharge of approximately 3,000 gallons of heavy fuel oil into Mississippi Sound on December 4, 1984. It is believed that the spill was from a tanker. Some oil from the spill washed ashore on the northern portion of Horn Island which is a part of Gulf Islands National Seashore. Tar balls resulted and covered an area 3-4 yards wide along the high tide mark for a distance of 3-4 miles. By December 14, 1984, the U.S. Coast Guard reported the removal of 64 bbls (2,710 gallons) of oil and 140 bbls (5,950 gallons) of oiled sand. A total of $35,000 was spent in the cleanup effort with monies from the cleanup to be taken from the Oil Pollution Compensation Fund. No birds or vegetation were reported to have been damaged. The professionals contacted to obtain information concerning the Horn Island Spill reported a good cleanup.

Shell Pipeline Spill, LA: The Shell Pipeline Spill occurred in Main Pass Block 73 on February 16, 1985, with an initial spill of 320-360 bbls (17,000 gallons). Another 40-50 bbls (2,300 gallons) were spilled during the week of Febraury 24 as a result of pressuring the line to discover the leak. Of the total 410 bbls spilled, approximately 160 bbls were recovered.

The Louisiana crude oil came ashore on Grand Gosier, Curlew and Breton Islands. Approximately seven miles of beach were contacted, and the intertidal zone 3-4 yards wide was impacted along the beach. The most severe impact was on Curlew Island where approximately one acre of Spartina alterniflora was oiled along the intertidal zone. No marshes were contacted on Breton or Grand Goisier Islands. No oyster beds were contacted.

Fish and wildlife resources impacted were limited to birds. Fourteen birds were oiled by the spill, including ducks, gulls, and loons. A bird cleanup station was set up in Venice, Louisiana, and Alice Berkner, a nationally recognized bird cleaning expert, was on the scene to direct cleanup operations. One common loon and one gannet were cleaned; the loon survived but the gannet did not. The species breakdown of the remaining 12 birds killed was not available.

The slick traveled approximately 25 miles and came ashore on the leeward side of the islands. Cleanup operations spanned 14 days and were accomplished under the leadership of Shell Oil Company in cooperation with the U.S. Coast Guard. Approximately 320 man-days of effort were expended to clean the three islands. Detailed cost of the cleanup is not available.

AMOCO Well Blowout - West Delta Block 90: On February 21, 1985, a well blowout occurred on an offshore platform being operated by AMOCO in the West Delta Block 90 area. Approximately 60 bbls (2,500 gallons) of Louisiana crude oil was spilled. Approximately 250 gallons of the dispersant COREXIT 9527 was reportedly used at the spill site. The authorization for use of the dispersant is under investigation by the U.S. Coast Guard.

The resulting slick traveled approximately 40 miles to the northwest and made landfall on the Louisiana coast in Lafourche Parish just west of Grand Isle. Approximately 5-10 bbls (420 gallons) of the original 60 bbls reached the beach. All oil was cleaned from the beach except one gallon. No impacts to wildlife, marsh vegetation, or oyster beds were reported. The case was closed by the U.S. Coast Guard on February 28, 1985.

Alvenus Oil Spill: On July 30, 1984, the British Tanker Alvenus grounded and cracked in the Calcasieu Ship Channel in the Gulf of Mexico 11 miles south of Cameron Parish, Louisiana, in West Cameron Blocks 31 and 62. It was reported to have spilled 45,000 bbls (2.27 million gallons) of heavy Venezuelan crude oil over the next few days. The oil stayed adrift in the Gulf, moving in a westerly direction until August 3-4, 1984, when it began to come ashore on the Texas beaches between High Island and Galveston's West Beach. By August 7, 1984, no slick associated with the Alvenus was evident in the Gulf.

Impacts to sensitive coastal habitats centered on the recreational beaches and coastal marshes in Texas. Approximately 100,000 yd^3 of oiled sands were removed from an 8-mile stretch of Galveston beachfront in a 110 ft wide strip about 5 inches deep. Bolivar Peninsula, specifically Rollover Inlet and Crystal Beach in Chambers County, was extensively oiled from the spill. Twelve birds of undetermined species were oiled resulting in five mortalities and seven being treated and released. One sea turtle of undetermined species was treated and released.

Cleanup lasted three to four weeks with the focus of effort on the tourist-related recreational beaches. Galveston beachfront owners filed a $100 million class action suit for damage compensation based on loss of income and expenses for cleanup. Very little oil was reported to have breached the beaches or entered the coastal marshes. The State of Texas, however, filed suit for compensation to damaged marshes and other resources.

South Florida Oil Spill: On January 18, 1985, a spill of approximately 175 bbls (7,500 gallons) of No. 6 heavy crude oil occurred from the cargo ship M/V Nememcha. The spill occurred during an oil transfer from one fuel tank to another approximately 30 miles south of Key West, Florida. The oil formed a slick 200 yards wide and drifted within 11 miles of Key West, then drifted into the Atlantic Ocean following the Florida current. The slick did not contact land or any coral reefs. No cleanup action was taken because the spill was predicted to drift into the Atlantic Ocean. No evidence of impact to sensitive coastal habitats was noted.

Padre Island National Seashore Drum Project: On January 7, 1985, a total of 141 drum containers were collected, sampled, and logged for content analysis from the Padre Island National Seashore. These drums are believed to have been "lost" overboard accidentally or deliberately. All of these containers were unmarked; some were rusted and therefore, the owners could not be identified. Containers that were corroded and leaking were stored in salvage drums to prevent contamination. The barrels washed up on the beach area extending from 26°50'N to 97°20'W. Of the 141 drums, 40 drums contained small amounts of barium, 29 contained barium and other chemicals, 34 were identified as non-hazardous, 11 were identified as hazardous liquids, and 27 contained other various chemicals. Peterson Maritime is the company that was involved in the cleanup activities. It is estimated that a total of $215,000 has already been spent for cleanup activities and the cost is estimated to rise to $250,000 before the cleanup is finished. Monies were taken from the "Superfund" account. The containers are presently waiting to be transported and disposed at an approved toxic management facility in Peco, Texas.

A meeting was held as a result of this incident. Federal representatives from USCG, NOAA, NPS, MMS, FWS, and DOI's Office of Environmental Review attended. In addition, representatives from the Texas Department of Water Resources and Peterson Maritime attended. The main purpose of the meeting was to resolve the problems of identifying and disposing of the materials. Concern was also expressed with being able to trace these materials back to the responsible party and that the drums may be coming from offshore facilities. MMS responded that according to revised OCS Order No. 1 (30 CFR 250, January 16, 1984) operators are required to mark with the owner's name skid-mounted equipment, portable containers, spools or reels, and drums prior to use or transport over open OCS waters. If equipment is not marked, MMS is required to issue a citation. The overall conclusions of the meeting were that the problem of disposing of these drums will get worse. An additional meeting is scheduled for March 21, 1985, to discuss the changing of policy and/or regulations.

Since January 1985, a total of 31 additional drums have washed ashore. The drums, like the first group, are unmarked and rusted. This has been an on-going problem for years and is continuing. At present, it is not resolved where the drums are coming from.

Fire and Explosion - B Platform, High Island Block A-571: On February 21, 1985, a fire and explosion occurred from 7:30 p.m. until 11:00 p.m. at the CNG platform B located in High Island Block A-571. The automatic emergency shutdown valve shut in the well. There were 12 people on board platform B at the time of the explosion and 55 people were on board platform A. Workers were evacuated by a standby boat and one safety capsule, which is available at all times. A workboat and speedboat were in the area and were also used for the evacuation. A total of five people were injured and there were no casualties. Of the five injured, four were evacuated by helicopter to a nearby burn center. The cause of the fire and explosion was determined to be a gasket failure on a 16-inch inspection plate for a high pressure separator. There was no pollution as a result of this accident, and personnel were back on board at 1:00 a.m. the next day.

Atchafalaya Barge Spill: On March 5, 1985, a Hollywood 2006 Barge, under tow, hit a submerged object which tore six holes in one tank of the barge. The object is unidentified at the present time. Approximately 500 bbls were spilled. The spiller deployed a 1,800 ft boom and was able to contain the spill. Peterson Maritime of New Orleans handled the cleanup. As of March 7, 1985, 75 bbls remained to be cleaned up. Cleanup activities continued 2-3 more days. There appears to be no ecological problems at this time despite the size of the spill. The monies for the cleanup were charged to the Coast Guard's Revolving Fund. At this time, the total cost of the cleanup is undetermined.

C. ITEMS OF SPECIAL CONCERN

1. Hazardous Conditions

Within the Gulf of Mexico major geohazards to oil and gas development are associated with seafloor geologic features which result in seafloor instability. These hazards present many operational limitations to the exploration and development of oil and gas. Seafloor instabilities present limitations and necessitate adaptations in the siting, structural engineering, and routing of pipelines, exploratory drilling and production platforms.

For greater detail of potential geohazards existing within areas of the Gulf of Mexico, see Volume 1, Section III.A.1. of the Final Regional EIS.

Under the schedule for oil and gas leasing, the offering of all blocks within the CPA and WPA does not allow for presale geohazard block evaluations that use to be done. Instead, the Secretary of the Interior has announced that geohazard surveying and evaluation will be done by industry. The Regional Director (ORD) of MMS will notify the lessee through NTL 83-3 (Appendix F of Final EIS 81/84) that such conditions exist to take precautions in site selection and design. Thus, industry has the responsibility to interpret in detail and furnish the ORD with the results of surveys for the blocks leased within the geohazardous areas. Subsequently, industry must indicate to the ORD how plans of exploration and development minimize and/or avoid the geohazards which exist within the lease area.

Prior to the installation of any structure or pipeline, the grantee shall conduct a shallow hazard analysis in the immediate area of the proposed activity to locate, identify, and assess the potential geologic hazards and engineering constraints that may be present.

In essence, a shallow hazards analysis shall include the following:

- An assessment of any seafloor and subsurface geologic and man-made features and conditions which may have an adverse effect on the proposed operations. Seafloor geologic hazards include fault scarps, gas vents, unstable slopes, and reefs. Subsurface geologic hazards include faults, gas-charged sediments, abnormal pressure zones, and buried channels. Man-made hazards include pipelines, wellheads, shipwrecks, ordnances, communication cables, and debris from previous oil and gas activities.

- A specific discussion of mass movement of sediment, unstable slopes, active faulting, or gaseous sediments when required by the special operational constraints on some leases.

- A discussion of any special safety measures that would minimize the effects of shallow hazards on the proposed pipeline including a discussion of how compliance with provisions of NTL 83-3, Section IV, paragraph B, will be accomplished.

Under the post-sale regulatory authority of MMS the lessee is required to obtain detailed site-specific geologic hazards information, including soils borings in special cases, over locations on leased blocks where pipeline development is proposed. This mandatory requirement is imposed on all lessees to assure safety of operations prior to approval of pipeline permits. The extent and degree of geologic hazards investigation required of the lessee is at the discretion of the appropriate ORD, who is charged with approval of the safety of OCS operations. The general procedures to be followed by the lessee in conducting site-specific geologic hazards survey are set forth in NTL 83-3 issued by MMS. The NTL and applicable letters to the lessee serve as guidance for minimum requirements and in no way restrict the authority of the ORD to impose additional requirements on the lessee when necessary.

2. Ordnance Disposal

The Department of Defense's (DOD) explosives dumping areas found in the Gulf planning areas are shown on Figure I-5. Most of the small areas contain a single, undetonated depth charge. For the large areas shown, dumping consisted of old ordnance and unexploded (duds) shells and depth charges. All explosive areas have had no dumping activities since 1969-1970. However, all lessees should take precautions in drilling and locating structures within or near these areas due to the presence of unexploded ordnance. The U.S. Air Force (USAF) has released an indeterminable amount of unexploded ordnance in water test areas 1 and 3 as a result of testing and training missions. The exact locations of this unexploded ordnance cannot be determined and all lessees in the Gulf should take precautions in drilling or locating structures due to the potential that exists. In past sales this warning has been provided to each lessee in an ITL (Information to Lessees).

3. Blowouts

During oil and gas operations on the OCS, blowouts are the incident that is most feared and has the greatest potential for causing the greatest number of deaths, injuries, property damage or loss, and pollution. A blowout is considered a complete loss of well-control. However, well blowouts and platform or drilling rig losses are rare occurrences during offshore drilling operations.

Two substances can be responsible for the pressures which cause a blowout--oil and gas. Very shallow gas may occur in unconsolidated sediments at depths of 100-500 ft below the mud line. Drilling through these shallow gas zones requires extreme caution. A delicate balance between drilling-mud pressure and formation pressure is necessary to prevent an influx of gas into the wellbore and not fracture the near-surface formations. Shallow gas and formation fracturing is an even greater potential hazard in deep waters because it is more difficult to keep in proper balance with the ocean water and overburden pressures.

When a well blowout occurs, the loss of control could be momentary and control could be immediately regained using standard onsite safety equipment and procedures, or it may continue for several days. The duration of blowouts that occurred in 1979 through 1984 ranged from immediate shut-in to 57 days to regain control. The amount of pollution per blowout ranges from 1-64 bbls (Table IV-29). Since 1970 no oil spill of 1 bbl or more has occurred as a result of a blowout during drilling operations. In addition, the amount of oil pollution during blowouts has been decreasing. The amount of gas escaping during a blowout is difficult to determine; however, no identifiable environmental damage was caused by blowouts from 1979-1984.

Industrial expertise in safety has been increasing as industry has advanced drilling technology. MMS is supporting studies on blowout prevention, blowout fire suppression, and the collection of blowout oil before it disperses into the open ocean. An important factor in ensuring that offshore oil and gas operations are carried out in a manner which emphasizes safety of operations and minimizes the risk of environmental damage is the proper training of personnel in pollution prevention procedures. The enacted Safety Device Training Program requires all personnel to receive training for the installation, testing inspection, and operation of

Table IV-29

Blowouts in the Gulf of Mexico, 1979-1984

Year	Drilling, Exploration, and Development	Nondrilling Completion, Production, and Workover	Total Blowouts	Pollution	Deaths/Injuries	New Wells Started
1979[1]	5	0	5	0	8/9	1,109
1980[1]	4	4	8	1 bbl*	5/39	1,079
1981[1]	3	7	10	65 bbls*	7/4	1,106
1982[1]	4	4	8	0	0/7	1,155
1983[2]	8	3	11	0	0/2	981
1984[2]	3	1	4	0	4/3	1,163

*Occurred as a result of nondrilling event.

[1] U.S. Geological Survey Open File Report 83-562, August 1983.

[2] Minerals Management Service Events File and Quarterly Reports, 1983 and 1984.

For information on blowouts prior to 1979, see U.S. Geological Survey Open File Report 80-101.

production, safety, and pollution prevention equipment. The Well-Control Training Program was instituted by MMS in 1979. It requires all personnel involved in offshore drilling activities to be trained in well-control operations, and has requirements for periodic refresher courses.

D. ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTIONS AND ALTERNATIVES

1. Central Gulf Sale 104

a. Impacts from Alternative A - The Proposed Action

(1) Impacts on Sensitive Coastal Habitats (Wetlands)

The sensitive coastal habitats considered in the analysis include seagrass beds, mangroves, and other wetlands (both non-forested or tidal marshes, and forested).

Wetlands loss has been and continues to be of concern in many areas of the Gulf Coast from Texas to Florida. In the Mississippi Deltaic and Chenier Plains of Louisiana, the rate of wetlands loss is very high and of major concern. Gagliano (1981) estimated that the annual wetlands loss in 1980 in the Mississippi Deltaic Plain of Louisiana was 39.4 square miles (25,216 acres). During the period 1952-1974, the average annual rate of wetlands loss in the Chenier Plain was estimated at 7.7 square miles (4,928 acres) (Gagliano et al., 1981). The present estimated collective rate of wetlands loss for the Mississippi Deltaic Plain and the Chenier Plain is 50 square miles (32,000 acres) per year (Boesch et al., 1983).

Many interacting factors cause wetland loss. The scientific literature indicates that the major factors are sedimentation-submergence, canalization, land surface development, and miscellaneous onshore activities. The prevailing facts and scientific opinions on the relative importance of these elements are summarized below. Sedimentation, which under natural conditions, would ameliorate wetland loss, is declining. Sediment deprivation is primarily the result of a decrease in sediment load in the Mississippi River, the prevention of overbank deposition and crevassing, and the confinement of Mississippi River flow to main channels. Tuttle and Combe (1981) indicate that the modern suspended sediment load of the Mississippi and Atchafalaya Rivers has decreased by 50% since 1950.

Submergence of the wetlands is influenced by the rate of rise in sea level and subsidence of the land. Most experts agree that the rate of global rise in sea level slowed considerably about 5,000 to 7,000 years ago when most of the continental ice sheets had melted. During this century, however, the rate of rise of sea level has increased to 12 cm/century (Gornitz et al., 1982). Geologic studies indicate that prior to about 5,000 years ago, submergence rates were occurring too rapidly (25 cm/century) for marshes to persist in the coastal areas (Coleman and Smith, 1964). The submergence rate at which marshes deteriorate is variable depending on local sedimentation rates. Delaune et al. (1983) estimated the submergence rate in Louisiana at 1.2 cm/year. Submergence is also affected by geosynclinal downwarping; compaction, dewatering, and flow of recent sediments; and fluid withdrawal (hydrocarbons and water). The contribution that each of these processes makes to subsidence has not been quantified.

The impacts of canals on coastal wetlands include both direct and indirect impacts. The direct loss of wetlands associated with oil and gas development results from dredging activities, dredged spoil disposal, and canal widening. Indirect losses result from hydrologic changes that develop in wetlands after canalization has occurred. Turner et al. (1982) estimated that canals accounted for 2.4% of the coastal area in 1978. The cumulative linear extent of canals has not been unequivocally determined, but estimates are 4,573 miles in 1970 (Barrett in McGinnis et al., 1972) and 6,100 miles in 1984 (U.S. Army Corps of Engineers, 1984b). Canals widen through use, generally as a result of wave action and altered hydrologic patterns. According to Craig et al. (1979), the annual increase in canal width ranges from about 2%-14% per year for a doubling time of 5-60 years. Variability in widening rates is associated with firmness of the marsh substrate and the amount of traffic in the canal (Johnson and Gosselink, 1982).

Indirect impacts of canalization affecting wetlands loss include hydrologic interruptions and saltwater intrusion. Scaife et al. (1983) indicate that hydrologic interruptions created by spoil banks are a primary factor affecting wetlands loss. Intersecting spoil banks partition areas of marsh and impede drainage. Poor drainage is deleterious to plant survival (Mendelsohn et al., 1981), and as vegetation in impounded areas dies, ponds appear.

Canals act as conduits for the inland movement of comparatively saline water. Saltwater intrusion kills salt intolerant plants, thereby contributing to wetland deterioration. It is established that saltwater intrusion is damaging to freshwater wetlands, especially to "flotant marshes" which lack a firm subsoil and consist entirely of salt intolerant vegetation. Plant species in brackish marshes can tolerate higher salinities and may not be severely damaged by an increase in ambient water salinity.

Estimates of the contribution of canalization to wetlands loss vary. Turner et al. (1982) estimates that 10% of the coastal land loss is caused by the direct impacts of canals and as much as 80% by indirect impacts. Most estimates of wetlands loss from direct and indirect impacts combined range from 12%-65% as indicated below:

Author	Estimated Percent of Wetlands Lost Through Direct/Indirect Effects of Canalization
Manning, 1972 (in McGinnis et al., 1972)	12%
Deegan et al., 1979	33%-67%
Gagliano, 1973	45%
Craig et al., 1980	20% (direct loss in Barataria Bay)
Scaife et al., 1983	48%-97%

Based on available information, there is sufficient evidence to assume that sedimentation and submergence processes are more important than canalization in wetlands loss in coastal Louisiana. On the Mississippi River Delta, Wells et al. (1983) have documented that the growth and decay of subdeltas and associated wetlands near the mouth of the modern main channel of the river occur in cycles of about 100 years. These cycles are associated with natural processes, such as crevassing, channel extensions, channel abandonments, and subsidence, and appear to occur independently of canalization activity. Cleveland et al. (1981) have used simulation models to demonstrate that if sediment from the Mississippi River were reintroduced into the Barataria basin, an area with an extensive canal network and severe land loss, the basin would experience net wetlands gain during the next century. Furthermore, wetlands loss is occurring in other estuarine and deltaic areas where oil and gas activities and canalization are not occurring such as in the Chesapeake Bay (Kearney et al., 1983; Pendleton and Stevenson, 1983) and in Texas on the Colorado (Kanes, 1970) and Guadalupe (Donaldson et al., 1970) River Deltas.

Miscellaneous factors including marsh burning, marsh buggies, onshore oil and gas well site construction and brine disposal affect wetlands loss. Recent studies (Bahr and Wascom, 1984) report major marsh burns that resulted in permanent wetlands loss. Sikora et al. (1983) reported that in one 16 km^2 wetland area in coastal Louisiana, an alarming 18.5% of the area was covered with marsh buggy tracks. Well site construction activities involve board roads and ring levees. Ring levees are approximately 4-acre impoundments constructed around a well site. McGinnis et al. (1972) estimated that between 1950 and 1971, 20,442 well completions were made in coastal Louisiana. By 1984, the total number of wells drilled in the coastal parishes had increased to approximately 41,000 (USGS, Office of Energy and Marine Geology, Personal Communication, October 1984). Brine disposal associated with oil exploration may have a significant local impact near well sites.

Another type of impact producing factor which can cause severe adverse effects is oil spillage. More specifically, an oil spill coming into contact with seagrass beds, marshes, or mangroves could cause devastating and relatively long-term damage.

Important variables determining the degree of impact include the amount of toxicity of the crude, the degree of weathering the crude has undergone prior to contacting a wetland, wetland type or types contaminated by the crude, the climate and weather of the spill site, the water depth and suspended sediment load, the cleanup method attempted, and previous exposure to oil spills.

For this analysis the assumption is made that the emplacement of one mile of pipeline could temporarily destroy up to 6 acres of seagrass beds, and that onshore pipeline emplacement could permanently destroy up to 12 acres of sensitive coastal habitat per mile of pipeline. In addition, the following estimates of the maximum acreage used for new onshore infrastructure/support facilities are considered in the analysis: exploratory drilling service base - 15 acres; development/production service base - 75 acres; pipeline installation service base - 5 acres; pipe coating yard - 150 acres; pipelines per mile - 12 acres; platform fabrication yard - 400 acres; gas processing plant - 75 acres; and marine terminal - 30 acres.

The following five levels of impact are used in the analyses and conclusions that are subsequently discussed (the numbers in parentheses refer to the number of oil spills of 1,000 bbls or more contacting a sensitive coastal habitat within 10 days):

Very High - Very severe long-term adverse effects: more than 2% of the habitat area destroyed or damaged; or loss/interference due to oil spill contacts with mangroves (2 or more), other wetlands (4 or more), or seagrasses (8 or more).

High - Major long-term adverse effects: 1%-2% of the habitat area destroyed or damaged; or loss/interference due to oil spill contacts with mangroves (1), other wetlands (2-3), or seagrasses (4-7).

Moderate - Moderate adverse effects: 0.25%-1% of the habitat area destroyed or damaged; or loss/interference due to oil spill contacts with other wetlands (1) or seagrasses (2-3) and no spill contacts with mangroves.

Low - Minor adverse effects: 0.02%-0.25% of the habitat area destroyed or damaged; or loss/interference due to oil spill contacts with seagrasses (1) and no spill contacts with mangroves or other wetlands.

Very Low - Negligible to minor adverse effects: 0.02% or less of the habitat area destroyed or damaged; and no spill contacts with seagrasses, mangroves, or other wetlands.

In the analyses that follow, the coastal subareas (Figure IV-1) are used as the basic geographic unit for estimating and describing impacts. An expected level of impact is estimated for each affected coastal subarea using the five levels of impact as defined in the preceding paragraph. The assumed locations of all developments such as pipelines and onshore support facilities used for Sales 94 and 98 are used for this analysis.

Impact Analysis

One large spill (1,000 bbls or greater) contact with sensitive coastal habitats is assumed for analysis purposes (Section IV.A.5., Table IV-16). The expected impact of such a spill contact has been considered for each of 10 Louisiana coastal parishes which contain sensitive coastal habitats (wetlands). Cameron, Vermilion, Iberia, Terrebonne, Lafourche, Jefferson, Plaquemines, and St. Bernard/Orleans/St. Tammany Parishes contain non-forested wetlands that are classified on

Visual No. 14 as exposed to an oil spill. In these parishes, such a spill contact could cause a moderate level of impact based on the criteria presented above. Terrebonne, Lafourche, and St. Bernard Parishes contain mangroves classified on Visual No. 14 as exposed to an oil spill. It is noted that the probability of such a spill contact is 18% indicating that the occurrence of a spill contact is unlikely. Several smaller oil spill contacts (less than 1,000 bbls) are also assumed. These contacts could also adversely affect sensitive coastal habitats.

In coastal subarea C-1 (Cameron, Vermilion, and Iberia Parishes, Louisiana), 0-1 oil/gas transmission pipeline landfall is estimated. This pipeline could be routed to either Grand Chenier (Cameron Parish), Abbeville (Vermilion Parish), or Weeks Island (Iberia Parish). Numerous canals/waterways exist from the coastline to Grand Chenier, in the coastal area below Abbeville, and in the coastal area near Weeks Island; consequently, if these routes are followed, little impact will occur on wetlands habitats. If these routes are not followed, up to 48 acres of wetlands could be permanently destroyed in the Grand Chenier area; up to 132 acres in the area south of Abbeville; and up to 180 acres in the area south of Weeks Island. The pipeline going to Grand Chenier could instead go to Cameron (Cameron Parish) and result in a wetland loss of only 12 acres. No other onshore facilities are estimated for coastal subarea C-1. Therefore, a maximum of 180 acres of sensitive coastal habitats could be destroyed in this coastal subarea. This represents a loss of 0.01% of these habitats in C-1.

In coastal subarea C-2 (St. Mary, Terrebonne, Lafourche, and Jefferson Parishes, Louisiana), 0-1 oil/gas transmission pipeline is estimated. This pipeline could be routed to either the Patterson area (St. Mary Parish), Dulac area (Terrebonne Parish), or Golden Meadow area (Lafourche Parish). A pipeline to Patterson could permanently destroy up to 168 acres of wetlands; a pipeline to Dulac up to 144 acres of wetlands; and a pipeline to Golden Meadow up to 144 acres of wetlands. Therefore, a maximum of 168 acres of sensitive coastal habitats could be destroyed in this coastal subarea. This represents a loss of 0.01% of these habitats in coastal subarea C-2.

In coastal subarea C-3 (Plaquemines, St. Bernard, Orleans, Jefferson, St. Charles, St. John the Baptist, Livingston, Tangipahoa, and St. Tammany Parishes, Louisiana), 0-1 oil/gas transmission pipeline making landfall in either of three possible locations is estimated. The landfall sites could be in the Barataria Bay area with the pipeline continuing to Lafitte (Jefferson Parish), in the Buras area (Plaquemines Parish), or in the Yscloskey area (St. Bernard Parish). There are enough canals/waterways at all three locations that few sensitive coastal wetlands impacts would occur provided these routes are followed. If they are not followed, up to 204 acres of wetlands could be destroyed by the Lafitte pipeline; up to 96 acres by the Buras pipeline; and up to 180 acres by the Yscloskey pipeline. Therefore, a maximum of 204 acres of sensitive coastal habitats could be destroyed in this coastal subarea. This represents a loss of 0.02% of these habitats in coastal subarea C-3.

In coastal subarea C-4 (Hancock, Harrison, and Jackson Counties, Mississippi; and Mobile and Baldwin Counties, Alabama), no pipeline landfalls are estimated. The only onshore facility estimated to be constructed is 0-1 development/production service base. This could result in the destruction of up to 75 acres of sensitive coastal habitats. This represents a loss of 0.02% of these habitats in coastal subarea C-4.

Conclusion

The level of expected impact on sensitive coastal habitats (wetlands) is estimated to be moderate in coastal subarea C-1, high in coastal subareas C-2 and C-3, and low in coastal subarea C-4.

Cumulative Impacts

In addition to the impacts described above for the proposed action, the following other major impact producing factors and expected impacts are considered in relation to sensitive coastal habitats. The non-forested wetland habitat base, 3,393,695 acres, in the CPA is decreasing at an estimated 50 mi^2 per year (Boesch et al., 1983). Major factors affecting this loss are sedimentation-submergence, canalization, land development, and miscellaneous factors including marsh buggies, marsh burning, onshore oil and gas activities, well site construction, and brine disposal. Sedimentation rates that nourish the coastal wetlands have declined in recent years. Tuttle and Combe (1981) indicate the suspended sediment load in the Mississippi and Atchafalaya Rivers has decreased by 50% since 1950. This decrease, in combination with leveeing of the Mississippi River, has severely reduced overbank sediment deposition. Submergence, consisting of eustatic sea level rise and coastal subsidence, is a factor affecting loss of sensitive coastal habitats. Although the rate of submergence in the CPA varies, it is more rapid than the global average. Delaune et al. (1983) estimates the submergence rate in Louisiana at 1.2 cm/year. Quantification of the percent of land loss due to sedimentation-submergence has not been completed.

Canalization for navigation and pipelines for the development of oil and gas resources onshore and offshore has affected wetlands loss.

Estimates of the linear extent of canals are 4,573 miles in 1970 (Barrett as cited in McGinnis et al., 1972) and 6,100 miles in 1984 (U.S. Army Corps of Engineers, 1984b). Craig et al. (1979) estimate canals widen annually from 2%-14% for a doubling time of 5-60 years. Canals cause hydrologic interruptions including impoundment and saltwater intrusion that accelerates wetlands loss. Estimates of the direct contribution of canals to wetlands loss vary as presented below.

Author	Estimated Percent of Wetlands Lost Through Direct/Indirect Effects of Canalization
Manning, 1972 (in McGinnis et al., 1972)	12%
Deegan et al., 1979	33%-67%
Gagliano, 1973	45%
Craig et al., 1980	20% (direct loss in Barataria Bay)
Scaife et al., 1983	48%-97%

Development of wetlands for residential, urban, and commercial uses is a major factor affecting wetlands loss in Louisiana. During the period 1952-1974 in the Chenier Plain region of southwestern Louisiana, an estimated 3,045 acres of marsh was converted to urban use (Gosselink et al., 1978). During the period 1956-1978, an estimated 132,034 acres of urban/industrial development occurred in the Mississippi Deltaic Plain region of southern Louisiana (Bahr et al., 1983).

Some indication of the extent of oil and gas activities for the development of onshore resources within the Louisiana coastal area is indicated by the onshore production data for 1954-1982. Cumulative production from the Louisiana coastal area amounted to 9.9 billion bbls of oil and condensate and 80.4 tcf of gas, which, by comparison, exceeded production from the Federal OCS by 72% and 50%, respectively. Furthermore, during the period of greatest State production, the open-ditch or "flotation" method was used for pipeline installation. This method involved dredging canals 40-50 feet wide, and 6-8 feet deep, often with an additional trench in the bed of the canal to provide 10-12 feet of clearance above the top of the pipeline. The dredge spoil was piled in levees along the edge of the canal (McGinnis et al., 1972). The flotation method is very destructive to marshes because of the large size of the canals and the associated prominent spoil banks. Since the early 1970's, the "push" method of installation has been used. The "push" method involves a much smaller ditch than the "flotation" method, and the dredged material is usually replaced into the ditch (a process called "backfilling") so that open ditches remain less frequently after completion.

No information is available on the total number or miles of pipelines installed in the coastal area. Since the beginning of the Federal oil and gas program in the Gulf of Mexico OCS region, approximately 135 pipelines have been installed from the OCS to the shoreline. Of these landfalls, approximately 127 are in Louisiana, 1 is in Mississippi, and 7 are in Texas (USDI, MMS, 1983e). Limited information is available on the number and locations of pipelines that originate in State waters and the onshore coastal area. Prior to the early 1970's, no records were kept of Louisiana pipeline installations. Since the passage of the Clean Water Act in 1973, COE has been mandated to issue permits for pipeline installations in wetlands. Although COE has these permits on file, the data are not compiled. The State of Louisiana has kept records on pipeline installations since 1980. Information obtained from the Louisiana Coastal Management Section Department of Natural Resources, indicates that coastal use permits were granted for 860 buried pipelines in the Louisiana coastal area between October 1980 and January 1983. According to MMS data, within the same period of the time, fewer than 20 pipelines from the OCS reached the coast of Louisiana. No comparable information is available for Texas.

Some indication of the total number of onshore pipeline installations is provided by well completion data. Approximately 41,190 wells have been completed in coastal Louisiana (USGS, Office of Energy and Marine Geology, Personal communication, October 1984). Of these, all successful gas wells required pipelines to transport production to trunklines. Oil production may be transported by pipelines, barges, or trucks. All three of these means of transportation, however, may result in wetland alterations (pipeline canals, navigation canals, or road construction). Although linear extent of the onshore pipeline networks has not been measured, the pattern is intricate and pervasive throughout the coastal area because of the dispersed distribution of the numerous oil and gas fields. Pipelines that originate on the OCS, however, gather production from widely distributed fields and bring it to shore through a small number of landfalls.

The above processes, which are occurring naturally and as a result of man-induced factors, affect the soil types, water depths, salinity levels, and vegetation communities in the sensitive coastal habitats. One major concern for which definitive information is available is pipelines. The ecological principals governing cumulative impacts of pipelines on the coastal marshes summarized in the Regional Environmental Assessment (USDI, MMS, 1983e) are presented below:

> A pipeline traversing coastal marsh habitat can cause serious and long lasting adverse environmental impacts. Regardless of the emplacement technique employed, an approximately 200-ft wide strip of marsh vegetation will be destroyed. This amounts to about 25 acres per mile. Excavation by a barge-mounted clam shell bucket dredge and use of other support equipment accounts for the loss of soil and vegetation. If the pipeline is installed by the flotation canal method, an open canal, about 40-50 ft wide and 6-8 ft deep, will remain after the dredging work is completed. The excavated spoils is left on the canal bank, with openings in the spoil bank to allow for drainage into and out of the canal. This type of construction activity usually has the following impacts on coastal marsh habitat. The open-ended (unplugged) flotation canal facilitates saltwater intrusion by allowing a faster rate of flushing fresh water out of the marshes, thereby lowering the water level and at the same time providing a direct avenue for saline waters to move farther inland at high tide. The effects of this very gradual process are usually not immediately apparent. Plant and animal species unable to adapt to higher salinity die and/or emigrate and are replaced by a more salt tolerant flora and fauna. As fresh marsh vegetation is killed by increased salinity, erosion of the soil, typically rich in organic matter, occurs. This erosion process is facilitated by a lack of plant roots that normally help to consolidate the substrate. Tidal flushing, often amplified by channelization of coastal streams, tends to remove loosened marsh soil particles. Tidal flushing, often amplified by channelization of coastal streams, tends to remove loosened marsh soil particles. Before new, more salt tolerant species can establish themselves, enough soil is usually lost so that marsh soil elevation may drop 4-8 in. In this manner, highly productive marsh is lost, and shallow ponds and lakes develop. Thousands of acres of marsh have thus been lost and converted to open water.

One major basic ecological factor regulating whether a pipeline will erode into adjacent marshes or revegetate is the presence or absence of exposed soil on which emergent vegetation can become established. Preliminary results of field studies by MMS on five pipelines in coastal Louisiana indicate that 20% of the corridor above the pipeline was vegetated. Natural control sites were 66% vegetated. Field observations during the study indicate that revegetation occurs faster and over a greater portion of the right-of-way where soils are firm. These observations, in view of the submergence rates being experienced in the CPA, point to a long-term cumulative impact that will decrease the present rate and extent of revegetation of pipeline rights-of-way.

Onshore facility construction related to the proposed action and prior OCS sales may destroy up to 795 acres and 4,311 acres of wetlands, respectively, for a combined total of 5,106 acres. These estimates assume that all facility construction will occur in wetlands with no significant mitigation of impacts. The percentages of the habitat base for the 795 acres, 4,311 acres, and 5,106 acres are 0.02%, 0.10%, and 0.12%, respectively.

Six large oil spill (1,000 bbls or greater) contacts resulting from Federal offshore and tankering activity are assumed with land segments containing sensitive coastal habitats. The assumed number and percent chance of these spill contacts with parishes/counties (land segments) and environmental targets are as follows: Cameron - 1 (41%); Vermilion - 1 (41%); Iberia - 1 (30%); St. Mary - 1 (3%); Terrebonne - 1 (65%); Lafourche - 1 (44%); Jefferson - 1 (44%); Plaquemines - 2 (76%); St. Bernard - 1 (40%); Hancock/Harrison/Jackson - 1 (18%); Mobile - 1 (4%); Mississippi seagrass beds - 1 (8%); Louisiana marshes - 6 (99%); and Louisiana mangroves - 3 (88%). In addition, one large spill (1,000 bbls or greater) contact resulting from State offshore activity and a number of smaller oil spill contacts (less than 1,000 bbls) could occur with sensitive coastal habitats as a result of offshore hydrocarbon activity in both Federal and State waters. These spill contacts could cumulatively cause considerable destruction and severe damage to sensitive and valuable wetlands, resulting in a very high level of impact.

Studies by O'Neil et al. (1983) indicate that effects of petroleum spills on marsh flora varies, long-term damage to oyster reefs is severe, and knowledge of effects on seagrass beds is lacking. *Distichlis spicata* was reported killed by repeated application of crude oil during a 5-month interval (Wilson and Hunt, 1975 in O'Neil et al., 1983). Recovery time of *Spartina alterniflora* from a crude oil spill was estimated at 1-3 years (Krebs and Tanner, 1981 in O'Neil et al., 1983).

Conclusion

The cumulative level of expected impact to the sensitive coastal habitats is estimated to be very high.

(2) Impacts on Sensitive Offshore Habitats

The resources of concern include the biological communities of the topographic features (banks) of the Central and Western Gulf and of the "live bottom" areas of the Central Gulf. For a summary discussion of these areas, see Volume 1, Section III of the Final Regional EIS as well as Section III of this document.

The potential causes of adverse impacts to offshore living resources from these proposed actions are oil spills impinging on the resource; mechanical damage to organisms (and their habitat) due to drilling, anchors, pipeline and platform emplacement, and smothering by drilling fluids or cuttings; toxicity to organisms of drilling fluids components; and mechanical damage due to blowouts.

Oil spills may result from three types of accidents: blowouts during the drilling or production of oil wells; the rupture of oil pipelines; or leaks from tankers. The latter could discharge either crude oil or refined oil into the water, depending on the cargo; a collision involving a tanker could result in a large amount of oil being released in a short period of time. All of these accidents could result in a steady discharge of oil over an extended period of time. Fortunately, these types of accidents are rare in the Gulf of Mexico (Section IV.B.).

Mechanical damage is destruction of organisms or substrate due to a physical action, such as grinding, crushing, and breaking, of the actual drilling operation itself; the anchors of certain types of drilling rigs and work boats connected with the drilling operation; the laying of pipelines, including the anchors of pipe-laying barges; the emplacement of certain types of drilling rigs; the emplacement of platforms; and the disturbance to the bottom that may be caused by a blowout that occurs on the bottom. This last item, blowouts, are relatively rare accidents. The other causes of mechanical damage are routine operations of oil and gas exploration and development activities and cannot be avoidable if OCS drilling is to take place. The area affected by these operations are small and in most of the Gulf present no ecological problems. On certain live bottom areas of the CPA and on topographic features of the CPA and the WPA, such operations may cause severe damage by destroying a large portion of the sensitive and unique organisms found there, such as corals and coral reef related communities (Section III.B.2.) Lease stipulations are included in the proposed actions to eliminate these impacts (Section II.A.1.b.(2) and II.B.1.b.(2)).

Drilling fluids (muds) and cuttings discharged are also routine operations (Section IV.C.3). Small areas of the seafloor, on the order of within 100 m of the discharge point, may recieve sufficient quantities of muds and cuttings to kill sessile organisms. This creates a serious environmental problem in live bottom areas and in the coral reef community areas of the topographic features. Drilling fluids also contain low concentrations of toxic constituents. Upon discharge into the water column, these concentrations are rapidly decreased by several orders of magnitudes to the point where they are relatively nontoxic (NAS, 1983).

The following definitions are employed in this section and in other sections of this EIS when referring to the expected level of impacts to sensitive offshore habitats resulting from these proposed actions:

Very High - A species, population, community, or assemblage will be harmed to the extent that recovery of that particular entity may not occur.

High - A significant interference with ecological relationships. This usually involves the mortality or a biological alteration of a noticeable segment of the population, community, or assemblage.

Moderate - A short-term interference with ecological relationships. Although some species may sustain substantial losses, other species will sustain low losses, and the ecological mix will not be altered.

Low - A few species may sustain low losses, but any interference with ecological relationships will not be evident.

Very Low - Loss of a few individuals but no interference with ecological relationships.

Impact Analysis

The offshore resources of concern in the Central Gulf are live bottom areas (a small area of the extreme northeastern Central Gulf sale area) and the coral and associated communities associated with topographic features generally found along the shelf break of the Central Gulf (Section III.B.2.).

The 16 (topographic features) banks of the Central Gulf containing biological resources which are of concern are (Visual No. 11):

Bank	Crest Depth (m)	Bank	Crest Depth (m)
18 Fathom Bank	50	Alderdice Bank	60
Bouma Bank	60	Parker Bank	58
Rezak Bank	60	Fishnet Bank	62
Sidner Bank	56	Jakkula Bank	60
Sonnier Bank	25	Sweet Bank	75
Sackett Bank	64	28 Fathom Bank	52
Ewing Bank	56	29 Fathom Bank	52
Diaphus Bank	74	Bright Bank	50

(It should be noted that 29 Fathom Bank and 28 Fathom Bank are located on the line between the CPA and WPA and thus are located in both.)

Potential causes of adverse impacts to those resources from the proposed action are oil spills (one large spill is considered likely in the CPA), mechanical damage to organisms (and their habitat) due to drilling, anchors, pipeline and platform emplacement, and smothering by drilling fluids or cuttings; toxicity to organisms of drilling fluids components; and mechanical damage due to blowouts. These impact producing factors are discussed above. The biological stipulation included in the proposed action will eliminate these threats to the biota of biologically sensitive areas, except for accidental oil spills.

Of the offshore resources in the CPA, only the seagrass beds are expected to be threatened by oil spills. Most live bottom areas and all the banks of the Central Gulf are, in general, not expected to be at risk from oil spills because of the water depth (i.e., 10 m or greater) at which these areas are found; although not extensively studied, it appears that the deepest oil is driven into the water column from a surface spill in 6 m, and even there it is found only in concentrations several orders of magnitude lower than that shown to have an effect on marine organisms (Lange, 1985; McAuliffe et al., 1975 and 1981). Furthermore, the fact that the topographic features are widely dispersed in the Central Gulf, combined with the probable random nature of spill locations, would serve to limit the extent of damage from any given spill to only one of the sensitive areas. Live bottom areas in shallower water will be more at risk should an oil spill reach these areas, but according to the oil spill risk analysis (Table IV-19), coastal Florida, Alabama, and Mississippi (where live bottoms areas are likely to be found) are at very low risk to being impacted by an OCS oil spill. Oil spills may occur from seafloor sources (pipeline accidents, oil well blowouts) or sea level sources (tanker accidents, leaks on the platform, etc.). Oil may be transported downward to some extent in the water column due to normal circulation processes but should not be transported below the pycnocline under normal conditions. Oil spilled from seafloor sources or spilled at the surface under certain circumstances, such as severe storms, may be entrained and transported for great distances in subsurface currents. This was the case for the Ixtoc-1 spill, where some oil released into the water column at the seafloor circulated in the Gulf below the surface for months before reaching the Texas coast (Section IV.B.6.b.). Such oil at depth could come in contact with the biologically sensitive topographic features (banks) of the Western and Central Gulf. It has been established, however, that at the East and West Flower Garden Banks subsurface currents moving around the banks prevent the settling and accumulation of most non-bank derived sediments (Texas A&M Research Foundation, 1983). Such currents would generally serve to sweep entrained subsurface oil past the banks in similar fashion, preventing prolonged contact with any organisms, and normally preventing adverse impacts that oil might induce. The Texas A&M Research Foundation report (1983) documents the geological and biological evidence that supports this conclusion. Since the other clear water shelf-edge banks are quite similar to the Flower Garden Banks at similar depths (Section III.B.2.), it follows that similar current conditions probably prevail around them as well. Currents that flow around the banks sweep them clear of all but the heavier bank-derived carbonate sediments. Such dynamic conditions would, in most cases, effectively shield the banks from most potential impacts due to oil impingement and accumulation unless the spill occurred on or very close to the bank.

As discussed in Section IV.D.1.a.(1), the ecology of seagrass beds may be severely disrupted by oil spills reaching such areas. Such ecological insult could range from death of the seagrasses themselves to reductions in populations of fish, crustaceans, molluscs, and other invertebrates which utilize seagrass beds as habitat and as a source of food. The oil spill model indicates that the likelihood of a spill occurring as a result of the proposed action and impacting seagrass areas is quite low. However, a large spill reaching these areas within 10 days could devastate large areas of seagrass communities, which could in turn severely damage fish populations important to both commercial and recreational fisheries. Thus, there is a potential for very high impacts to seagrass beds from the proposed actions due to oil spills.

Oil spills, although possible, are not expected to pose a threat to the biota of the topographic features because of the depth of water at which these banks crest; while Sonnier Bank crests at 25 m, all the other banks of the CPA crest at 50 m or deeper. As noted above, oil is not expected to be driven deeper than 6 m, well below the tops of these banks (Lange, 1985; McAuliffe et al., 1975 and 1981). The problem of subsurface transport of oil is discussed in Section IV.B.6.b. The tops of the banks are often above the thermocline (Texas A&M Research Foundation, 1983), thus making the biota of the banks potentially susceptible to impingement by oil-laden subsurface water. However, it is expected that under normal conditions the subsurface currents flowing around the banks are strong enough to keep them clear of sediment (Texas A&M Research Foundation, 1983) and will also serve to keep the banks from accumulating any oil. With a platform at or very near the bank, the risk to the bank would increase in the event of a blowout or oil spill accident. Both events have low probabilities. Were one to occur, however, the effluents could impinge directly upon the edge of the bank. Impacts could then be serious to the local biota. Experience indicates that oil and gas are found in the vicinity of salt domes on which the topographic features of the Central Gulf are found. Destruction of the biota of such areas may have severe and long-lasting deleterious consequences on the specific commercial and recreational fisheries habitats affected, such as loss of habitat, loss of species (including prey species), destruction of hard substrate, and change in sediment characteristics, all of which may result in the reduction or loss of one or more fisheries. These areas also have intrinsic biological, ecological, and aesthetic values of their own which would be lost by such activities.

All the offshore resources of concern mentioned above would be at risk from drilling muds and cuttings discharges during drilling operations and to mechanical damage from construction activities were it not for the biological stipulations which will be included in leases on appropriate blocks (Section II.A.1.c.(1)). Impacts from these activities are generally quite localized in extent. However, the damage caused by these activities to unique and productive communities, such as coral reefs and live bottoms, would be quite severe in the absence of the stipulations. Section IV.A.4.a. discusses the discharge of drilling effluents in some detail.

Considerable mechanical damage will be inflicted upon the bottom by normal and routine oil and gas operations. The drilling operation itself disturbs some small areas. Anchors from support boats and ships, floating drilling units, and pipeline laying vessels do a great deal of damage to live bottoms and corals. The area actually affected will depend on depth of water, length of chain, size of chain, wind, and current, but severe damage to sensitive communities can occur within the area. Pipeline emplacement also causes considerable disruption to the bottom (Section IV.C.2.). It is estimated that six acres of the bottom is physically disturbed per mile of pipeline laid; some 2,300-6,000 yd^3 of sediment are resuspended per mile of pipeline, depending on the size of the pipeline and depth of trenching (burial). Add to this damage caused by the eight anchors of the pipelaying barge and it is clear that considerable damage will be done if such activities are conducted in sensitive coral or live bottom areas. In fact, anchor damage is considered the most serious threat to coral reefs and live bottom areas. Anchor damage includes crushing and breaking of coral heads, and anchors often destroy a wide swath of sessile organisms as the anchor is dragged and the chain moves around as the vessel swings at anchor. The biological stipulations included as part of this proposed action will prevent such damage to sensitive biological areas from oil and gas operations.

The most extensive study of the effects of oil and gas operations in the Gulf of Mexico was the Buccaneer Gas and Oil Field study funded by USEPA and conducted by NMFS. This was a comprehensive five-year study of an established multi-structure operation some 45 km (24 nmi) off Galveston Island. A summary of the findings of the study was reported by Caillouet et al. (1981). Some of the conclusions are:

> Impacts of the Buccaneer Field can be classified into those associated with the presence of the structures themselves and those associated with the Buccaneer Field contaminants from a number of sources. The presence of the structure contributed to scouring of surficial sediments and provided artificial reef substrate upon which a fouling community developed and to which a variety of fishes and other motile organisms were attracted or otherwise aggregated. Fishes and other motile organisms used these sites as sources of food and cover.
>
> The Buccaneer Field investigation was unable to detect impacts beyond 100 m from production platforms.
>
> Not only are various biotic communities attached or attracted to artificial reefs represented by gas and oil field structures, but recreational fishermen and divers concentrate their activities near these structures, thus subjecting important reef fish populations to heavy fishing pressures and making them more vulnerable to fishing. An advantage may be that the heavy fishing pressure reduces the residence time of such "captive" fish populations, thus reducing the amount of time that individual fish are exposed to contaminants, allowing less time for possible bioaccumulation of contaminants that may be harmful to man.

Blowouts can present a serious threat (due to burying by resuspended sediments) to important biological resources if one were to occur near a coral or live bottom area (Section IV.C.1.). Gas well blowouts generally pose far less environmental risk than do oil spills, resulting only in very high concentrations of suspended sediments and increased levels of gas in the water column very near the source of the blowout. To the extent that oil or condensate is present in the reservoir, some liquid hydrocarbons may also be injected into the water column. The suspended sediments may be carried some distance by currents, but the bulk of the sediments are redeposited within a few thousand meters of the blowout site. Low-molecular-weight-hydrocarbons (gases) will dissolve in the water column until saturation is reached; both gaseous and dissolved low-molecular-weight hydrocarbons will be released into the atmosphere within a few days of a blowout without major biological effect. Liquid hydrocarbons will be diluted to background levels within a few thousand meters distance from the blowout site and will degrade with time. Fortunately, blowouts are quite rare in the Gulf of Mexico; for instance, from 1970-1979, there were 52 blowouts in the Gulf which works out to a rate of 4.3 blowouts per 1,000 wells drilled and 3.9 blowouts per 10,000 completions and workover operations (Offshore, 1982). This is one blowout per 232.6 wells and one blowout per 2,564 completions and workovers. This is a very low rate of occurrence. From 1979-1982, there were 31 blowouts in the Gulf, 16 during drilling operations and 15 during nondrilling periods. This works out to one blowout per 273 wells drilled and one blowout per 336 completions. Again, this indicates a very low incidence of accidents. Two of these blowouts (1979-1982) contributed all of the 65 bbls (2,730 gallons) spilled as a result of blowouts. No identifiable environmental damage was caused by this spillage, which represents 0.0000056% of the oil produced on the OCS during those years (Fleury, 1983).

A minor blowout occurred in March 1980, only 4.3 nmi northeast of the East Flower Garden Bank, in High Island Area, East Addition, South Extension, Block A-368. This blowout occurred when gas-charged sediments blew through the casing, releasing a small quantity of drilling mud into the environment. There was no discharge of seabed sediments nor oil or liquid hydrocarbons. No slick or other sign of environmental pollution was observed; therefore, no studies were conducted to determine impact at the Flower Garden Banks or elsewhere. Although this was a minor accident in terms of environmental impact, the platform was heavily damaged by the explosion and fire; six fatalities and twenty-nine injuries resulted.

A massive gas well blowout occurred in November 1976, approximately 36 nmi west of the West Flower Garden Bank in High Island Area, South Addition, Block A-563. This blowout occurred when the gas blew out around the casing and resulted in a crater approximately 550 m in diameter by 110 m deep. The entire platform structure was lost in the crater. Studies at this blowout indicated that the sediments resuspended by the blowout tended to settle out very near the blowout site with all deposition occurring within 3,000 m. No environmental impact due to hydrocarbons in the water column was found (Brooks and Bernard, 1977), but it is clear that the volume of sediment resuspended by the blowout would have caused a great deal of mortality had it taken place within 3,000 m of a coral or live bottom area.

One other source of discharges into the Gulf from routine oil and gas operations, which is sometimes cited as a potential hazard to biological communities, is produced water. The preponderance of the evidence indicates that such discharges are not an environmental hazard (Neff, 1981; Petrazzuolo, 1981), but for completeness the following brief discussion is included (see also Section IV.D.1.a.(3)).

Formation water, also called produced water, is the liquid associated with the extracted oil and gas and must be removed and disposed of. Produced water is relict seawater but with anomalous ion ratios (see also Section IV.A.5.). The following discussion of produced water is taken largely from Koons et al. (Offshore Operators Committee, 1975).

> Produced waters generally contain appreciable concentrations of dissolved inorganic salts in which the principal cations are sodium, magnesium, and calcium. The principal anions are chloride, sulfate, carbonate, and bicarbonate. The concentrations of total dissolved constituents can vary over a wide range from a few milligrams per liter to as much as 350,000 mg/l. Collins (1974, 1975) reviewed the composition of many oil field waters and found that the majority contained high chloride concentrations. Hydrocarbons and some organic compounds may be present in produced waters at part per million levels. Dissolved oxygen may be present at low concentration in produced waters.

The study of the Buccaneer oil field offshore (USDC, NMFS, 1977) reported that produced water was discharged at a rate of 138 m^3 per day between January 1975-February 1976. The average oil content of this produced water was 25.1 ppm. Near-platform macrobenthic populations were depressed and had a high turnover rate as compared to the surrounding sea bottom; this may have been a result of increased scour action around the platform structure itself, but no cause-effect relationship was established. OCS Order No. 7 requires that all discharges must meet EPA standards which allow no more than 72 mg/l daily maximum of oil and grease discharge and 48 mg/l maximum monthly average (72 mg/l is equivalent to 72 ppm). Furthermore, produced water discharges near topographic features will have to be shunted to near the bottom as required by the biological stipulation.

The 16 banks listed at the beginning of this analysis all contain biological resources similar to typical Caribbean reef flora and fauna at similar depths, and many contain isolated patches of various corals, including reef-building corals (Bright and Rezak, 1976, 1978a, 1978b, and 1981; and Texas A&M Research Foundation, 1982 and 1983). The impacts to these resources from oil and gas operations taking place immediately upon them would be very high and perhaps long-lasting, or even permanent. If complete communities are eliminated, which is possible because these areas are relatively small in size and are concentrated at these banks, recovery may be impossible. Some 8,605 hectares (21,263 acres) are included in the biologically sensitive areas of these banks.

As indicated above, oil and gas operations could cause severe damage to the live bottom areas and to the relatively small coral and coral related communities of the topographic features of the Central Gulf assuming the operations take place on or near these important and sensitive habitats. If there is leasing around one of the 16 banks of the CPA, up to 4 platforms of the 20 expected from the proposed action could be installed near that feature. If this happens, and the platforms are on or near the sensitive biological resources, the impacts to those resources could be very high. If complete loss occurs, recovery may never take place; in any event, recovery time will be in terms of years.

However, the biological stipulations (Section II.A.1.c.(1)), which are included in the proposed action, will serve to mitigate the potentially adverse impacts of oil and gas operations: (1) By creating "No Activity Zones" at the banks where the sensitive biota are located, the stipulation protects the high value coral and coral community habitats from all contacts with oil and gas exploration and development activities. If no activities, including the construction of pipelines, take place, the harmful mechanical impacts of those activities cannot take place. (2) By creating, where appropriate, "1 Mile Zones" and "3 Mile Zones" around these banks within which shunting and/or monitoring must take place, protection from the toxic and smothering effects of drilling muds is provided and a method (monitoring) is provided to document that no impacts are occurring. If the monitoring shows that the activities are impacting the biota of the banks, the ORD can take additional steps to prevent or halt such harm. To date, all evidence in the Gulf strongly indicates that the provisions of the stipulations are successful in preventing harm to the biota of the topographic features from oil and gas exploration and development activities (Bright and Rezak, 1978b and 1981; Neff, 1981; Petrazzuolo, 1981; Texas A&M Research Foundation, 1982 and 1983).

Conclusion

Activities resulting from the proposed action will have a very low impact on the biota of these areas.

Cumulative Impacts

Oil and gas operations have been increasing around the topographic features of the Central Gulf, and this trend will no doubt continue in the future. Of the 198 blocks in the CPA which are near (i.e., within 3 nmi of the bank) biologically sensitive areas, 114 are currently under active lease (Appendix A). All oil and gas operations on these blocks and those leased as a result of the proposed action will be subject to the provisions of the stipulation. (This is true even on the few older leases which do not contain the stipulation, since MMS applies the provisions of the stipulation in all appropriate instances.) Thus, as explained above, oil and gas operations are not expected to have an adverse impact on these unique and sensitive biological habitats.

However, application of the stipulation cannot prevent catastrophic accidents such as blowouts. As mentioned above, a subsurface blowout can resuspend large amounts of sediments and can entrain oil in the water column. By establishing No Activity Zones, the stipulation will preclude blowouts directly on the banks. Nearby blowouts, however, may affect the bank if subsurface currents carry sediments or oil to the bank. In most cases, it is expected that the currents will sweep the contaminants around the bank rather than deposit them on the bank (Texas A&M Research Foundation, 1983). Some small fraction of the sediments or oil may reach a bank and come in contact with organisms; the extent of damage will depend on the amount of contaminant and the length of time it remains on the bank. Amounts are not expected to be high because of dilution, dispersion, settling, and current action (sweeping the contaminant around the bank). Length of time on the bank may be long for the heavier sediments, but these are likely to settle out rapidly and not reach the bank at all (Brooks and Bernard, 1977). Because of this, and because blowouts are very rare, the risk to the biota of the topographic features is considered to be very low. A pipeline break discharging oil into the water will have much the same impacts as an oil spill at the surface. Such oil will rapidly rise to the water surface and will behave like a surface oil spill, since it is unlikely that oil from a pipeline break will become mixed with large amounts of sediment. Pipeline breaks are rare in the Gulf of Mexico (Section IV.B.).

Pipeline construction is another potential threat to the biota of the banks. As explained above, pipeline emplacement resuspends a considerable amount of sediment, and the pipeline itself can physically crush organisms. However, the biological stipulations will operate to preclude pipeline construction on the sensitive areas, and resuspended sediments are deposited within a few meters of the disturbance and are not expected to reach the bank (see also the discussion of resuspended sediments due to blowouts above).

Damage to the biota due to toxic effects from drilling fluid constituents is not expected to occur because of the high rate of dilution and dispersion (see above; NAS, 1983). Smothering from deposition of drilling fluids and drill cuttings is likewise not expected to be of any consequence following the same reasoning as used above in the discussion of blowouts.

As explained above, oil spills are not considered to be a threat to sensitive offshore biological habitats because of the depth of water over the topographic features of concern.

Anchor damage is considered to be the most serious threat to coral and coral-community areas (Bright and Rezak, 1978b and 1981). The biological stipulation prohibits the anchoring of industry-related vessels in the No Activity Zones; the stipulation does not, however, affect other activities such as fishing and sport SCUBA diving. No data are available on the extent to which such anchoring may take place. However, nearly all the banks are very close to (or even in) the shipping fairways that have been established in the Gulf, and since these banks are apparently well-known fishing areas, large ships which for some reason need to wait before entering a port may choose to do their waiting while fishing at a convenient bank. This practice may diminish as skippers become aware of the damage their anchors do to the biota of the banks. These activities may damage some portions of the biologically sensitive areas. Even though regulations of other agencies are in place prohibiting damage to corals (Section I.B.4.b.), anchoring may still take place in emergencies or through ignorance of the regulations.

Blasting (using high explosives) through coral reefs to recover alleged sunken treasure, while seemingly improbable, has been reported to have occurred at Bright Bank in the CPA. No documentation of any damage has been made. Such activities are specifically prohibited by the Coral FMP (Section I.B.4.b.). However, any blasting that might take place would destroy large areas which, if large amounts of sediment and substrate were removed, would never recover to pre-blasting conditions.

Although USEPA has no ocean dumping permits presently in place, such activities could take place in the future. It is unlikely that ocean dumping permits would be issued for areas near the biologically sensitive areas, since USEPA shares the concern of DOI for the protection of such areas. In any event, DOI would have an opportunity to work with USEPA in designating ocean dumping areas, if the need for them becomes apparent, to ensure that they were located far enough away from areas of biological concern to have no impact upon these areas.

Conclusion

OCS oil and gas activities are expected to have a very low impact on the biologically sensitive areas of the CPA OCS. However, other activities, especially anchoring right on sensitive topographic features, may cause high levels of ecological damage.

(3) Impacts on Water Quality

The following five impact levels will be used in the following analysis of potential impacts on both offshore and onshore water quality.

Very High - Water quality parameters change significantly by several orders of magnitude; toxic trace metals or hydrocarbons exceed USEPA safe levels; changes persist for months or longer.

High - Water quality parameters change significantly by one or two orders of magnitude; toxic trace metals or hydrocarbons near USEPA safe levels; changes persist for days to weeks.

Moderate - Statistically significant changes in water quality parameters which persist for several weeks.

Low - Some measures of water quality deviate significantly from ambient measures but are quickly (within 1-2 days) restored to normal.

Very Low - Normal measures of water quality such as oxygen content, salinity, temperature, transmittance, trace metal concentrations, and hydrocarbon levels show no statistically significant changes from ambient conditions (Table IV-30).

(a) Offshore

Under normal offshore operations, varying degrees of water quality degradation will occur as a result of oil and gas exploration and development activities in the Gulf of Mexico. Wastes from these activities are varied and may be transformed chemically, biologically, or radioactively when introduced into the marine environment. These wastes may be dissolved and form new substances or be mixed vertically and horizontally in the water column by small-scale motions or large-scale currents, and they may fall into the bottom sediments or be recycled by these same processes. This series of transformations or chemical reactions will govern a waste's transport through the water column and its toxicity to marine organisms. The bio-effects may be on individual organisms or whole ecosystems, with long-term effects such as changes in reproductive habits or genetic make-up of species. The method of delivery to the environment as well as the intrinsic chemical properties of each source will influence a waste's distribution throughout the Gulf.

Due to the complexity of these waste movements and behaviors, several parameters are needed to determine their extent of impact. Specification of point source functions, the form of the waste, rate of release, frequency of disposal, and geographical location of disposal are parameters essential in determining the extent of impact on water quality in any given area (Workshop . . . 1979). Also important are the areas impacted, the duration of impact, and the period of recovery. Potential water quality degradation resulting from increased offshore OCS oil and gas operations will be governed by several factors which include the resuspension of bottom sediments through exploration and development activities and pipeline construction; the discharge of deck drainage, sanitary wastes, and domestic wastes; the discharge of formation waters or produced waters; the discharge of drilling fluids and muds; accidental hydrocarbon discharges due to spills, blowouts, etc.; and the discharge of radionuclides into the marine environment. These factors are discussed briefly; however, for a more in-depth discussion of the subject, see Volume 1, Section IV.D.1.a.(13) of the Final Regional EIS.

Resuspension of bottom sediments may be expected to occur as a result of exploration and development activities and pipeline construction associated with increased OCS operations. Impacts resulting from the resuspension of bottom sediments may include increased water turbidities and mobilization of pollutants in the water column as a result of increased dredging activities in nearshore areas containing sediments of highly concentrated pollutants. The magnitude and extent of any turbidity increases will depend on the hydrographic parameters of the area, duration of the activity, and bottom material composition. Dredging activities in nearshore waters may result in resuspension of settled pollutants, toxic heavy metals, and pesticides, if present. The toxic effects of some of these pollutants could be long lasting in confined areas, depending on the quantities disturbed, local hydrographic effects, and the biota of the immediate area.

The discharge of treated sanitary and domestic wastes from the various rigs, platforms, etc., regulated by NPDES permits, will increase levels of suspended solids, nutrients, chlorine, and BOD in a small area near the point of discharge. Some residual chlorine may be present in discharged waters following treatment; however, due to evaporation and conversion to other chemical forms when combined with seawater, it is quickly diluted.

The discharge of formation water and chronic spills from platforms would result in increased petroleum hydrocarbon levels and possible trace metal concentrations in the marine environment. Formation waters or produced waters are classified as all waters and particulate matter associated with oil and gas producing formations. The amount of produced water generated is primarily

Table IV-30

Range of General Water Quality Values for Freeport, Texas, and West Louisiana Coastal Waters

Parameters	Present Studies	SEADOCK (1973)[1]	West Louisiana Coast (1978-79)[2]
S^o/oo	16.1-36.9	15.1-33.6	--
T (^{o}C)	10.5-31.5	11.1-30.6	--
pH	7.2-8.7	7.8-8.4	--
D.O. (mg/1)	1.1-10.3	0.2-10.9	--
O&G (mg/1)	< 0.5-23.4	< 0.3-2.6	--
TSS (mg/1)	< 0.1-264	5-85	--
NO_2-N (mg/1)	< 0.01-0.04	< 0.01-0.07	< 0.001-0.013
NO_3-N (mg/1)	< 0.01-0.67	< 0.01-0.14	< 0.001-0.15
NH_3-N (mg/1)	< 0.01-0.10	< 0.01-0.29	0.004-0.22
O-PO_4 (mg/1)	< 0.01-0.01	--	0.01-0.13
T-P (mg/1)	< 0.01-0.12	< 0.1-0.74	--
SiO_2 (mg/1)	< 0.05-4.2	--	0.17-2.4

Other Parameters[3]

Na	10,500 mg/1
K	380 mg/1
Ca	400 mg/1
Mg	1,350 mg/1
Cl	19,000 mg/1
I	0.06 mg/1
Br	65 mg/1

[1] SEADOCK. 1975. (8 stations nearest present study area).
[2] Brooks, J.M. 1979.
[3] Riley and Skirrow, 1965.

Source: Texas A&M Research Foundation. 1980.

dependent on the method of oil production, field characteristics, and location, with produced water production varying from less than 1% to 90% of the production fluids. These waters may contain high concentrations of total dissolved solids (TDS), oxygen demanding wastes, and toxic metals, in addition to oil and grease contaminants (Tables IV-31 and IV-32). Environmentally high levels of naturally occurring radionuclides are also present in these formation waters, up to four levels of magnitude higher than are found in open seawater. Though these levels are high, they do not seem to pose a hazard to the offshore environment due to the rapid dilution of these waters when discharged. Aside from that portion of hydrocarbons resulting from natural sources due to submarine seepage and from biochemical synthesis, the accidental discharge of petroleum hydrocarbons into the Gulf's waters due to blowouts, vessel collisions, pipeline breakage, etc., can be expected to impact the water quality of the Gulf. According to Gulf OCS statistics, oil spills in the Gulf have resulted in volumes equal to 0.007% of Gulf OCS production. These hydrocarbons may be transported to benthic sediments, entrained, or released into the water column over a period of time, or may be taken up by a variety of marine organisms directly from the water or marine sediments.

The discharge of drilling muds, sand, and drill cuttings, which are regulated by NPDES permits, may create turbidity plumes several hundred yards in length but will only affect those waters in the immediate vicinity of the rig. Drilling fluids, commonly called "muds," perform a variety of drilling functions, such as removing particles cut by the bit, cooling and lubricating the bit as it cuts, maintaining downhole pressure, and stabilizing the walls of the borehole. Most of these muds are water based; however, some have an oil base and are used in special situations, primarily freeing stuck drill pipe. These oil based muds contain carefully formulated mixtures of oxidized asphalt, organic acids, alkali, stabilizing agents, and high flash diesel oil, presenting a high potential for pollution. Aside from the normal use of muds and fluids during exploration phases of oil and gas extraction, well service and tertiary recovery techniques may contribute as sources of wastes and pollutants. For a further discussion on the effects of drilling discharges on the marine environment, see Section IV.D.1.a.(2) on sensitive offshore habitats.

Impact Analysis

In the Central Gulf, the addition of some 360 exploration/delineation wells, 200 development/production wells, 20 platforms, and up to 220 miles of pipelines are estimated for this area. Under this scenario, the discharge of an estimated 0.0015-0.135 billion bbls of formation waters, 1.64 million bbls of drilling muds, 0.1839 million yds^3 of drill cuttings, 75,000 bbls of sand from drilling operations, and an average of 84,000 gallons per day of treated sanitary domestic wastes from platforms may be expected as a result of the proposed action (Table IV-33). Pipeline-related activities would result in the disturbance of up to 1.32 million yds^3 of sediment under the same scenario. One oil spill greater than or equal to 1,000 bbls is assumed for the Central Gulf, based on the Oil Spill Risk Analysis (Section IV.B.2). Petroleum hydrocarbons introduced into the marine and coastal waters as a result of this spill may have varied effects on the local biota with impacts ranging from negligible to very high, depending on the resource impacted, the stage of weathering, and the local physical and meteorological parameters. Normal weathering processes, encountered with oil spilled into open water conditions, tend to detoxify the spilled oil by breaking down the toxic components of the oil. (See Section IV.B.4. for a discussion of fates and effects of spilled oil.)

Immediate effects would be brought on by increased drilling, construction, and pipelaying activities, causing an increase in water column turbidities of the affected waters. Such increases would have a nominal impact on the productivity of phytoplankton, but may cause a temporary clog in the respiratory and feeding mechanisms of numerous benthic and pelagic marine organisms within the area of construction. Pipeline construction activities may also result in the resuspension of settled pollutants, toxic heavy metals, and pesticides if present.

The discharge of treated sanitary wastes from the various rigs and platforms will increase levels of suspended solids, nutrients, chlorine, and BOD in a small area near the point of

Table IV-31

Gulf of Mexico Produced Water Composition - Major Constituents

Parameter	Units	Reference 1 X	Reference 1 Median	Reference 1 Range	References 2, 6, 3 X	References 2, 6, 3 Median	References 2, 6, 3 Range	Reference 4 Range	Reference 5 Typical
Physical Properties									
temperature	°C	38.1	39.2	22.6-48.2	20	20	20-21	-	-
specific gravity		1.110	1.101	1.073-1.151	-	-	-	-	-
surface tension	dynes/cm	63	62	57-68	-	-	-	-	-
Major Constituents									
pH		6.6	6.6	6.2-7.1	6.45	6.35	5.82-7.60	-	-
TDS	mg/l	129,950	114,000	80,500-203,000	102,172	107,353	11,273-199,313	169,000	-
SS (or TSS)	mg/l	-	-	-	45	41	18-87	12-656	-
CL	mg/l	-	-	-	60,283	60,518	16,667-115,481	42,000-62,000	300
SO_4	mg/l	-	-	-	9	0	0-69	-	-
K	mg/l	-	-	-	-	-	-	-	85
Sr	mg/l	-	-	-	-	-	-	-	-
Fe (total)	mg/l	-	-	-	29	-	8-100 (Ref. 3)	-	4
Mn		-	-	-	-	-	-	-	
Composite Organics									
oil (GR)	mg/l	39.0	37.0	7.6-77	-	-	-	-	-
oil (IR)	mg/l	56.9	43.5	15-106	-	-	-	-	-
COD	mg/l	-	-	-	-	-	-	182-582	-
BOD	mg/l	-	-	-	-	-	-	126-342	-
TOC (TOC mgC/L)	mg/l	-	-	-	404	463	68-661	-	

References:

1. Jackson et al., 1981 (10 offshore Louisiana platforms).
2. Myers et al., 1975 (25 Gulf Coast platforms).
3. U.S. Environmental Protection Agency, 1980.
4. Train et al., 1976.
5. Goodman and Troake, 1982.
6. Lysyj, 1982 (6 Gulf Coast platforms).

Source: Artic Laboratories et al., 1983.

Table IV-32

Gulf of Mexico Produced Water Composition - Trace Constituents

Parameter	Units	Reference 2		Reference 3		Reference 1, 4			
		X	Range	X	Range	X	Median	Range	
Trace Organics									
benzene	mg/l	3.5[a]	0.18 - 14.0	0.836	0.170 - 1.90	1.955	1.229	0.137 - 11.335	(Ref. 4)
toulene	mg/l	2.4[a]	0.16 - 7.95	2.074	0.770 - 3.30	-	-	-	
ethylbenzene	mg/l	0.23[a]	0.028 - 0.55	0.101	0.042 - 0.200	-	-	-	
naphthalene	mg/l	0.148[a]	0.018 - 0.300	0.027	0.012 - 0.044[g]	-	-	-	
phenol	mg/l	1.00[a]	0.20 - 3.40	0.486	0.018 - 0.840	2.203	0.808	0.108 - 20.812	(Ref. 4)
2,4-dimethylphenol	mg/l	0.132[a]	0.016 - 0.570	-	-	-	-	-	
bis(2-ethylhexyl) phthalate	mg/l	0.028[a]	0.016 - 0.118	-	-	-	-	-	
di-n-bitylphthalate	mg/l	0.010[b]	0.010 - 0.010	-	-	-	-	-	
benzo(a)pyrene	mg/l	0.016[b]	0.012 - 0.021	-	-	-	-	-	
2,4-dinitrophenol	mg/l	0.127[c]	-	-	-	-	-	-	
fluorene	mg/l	0.017[c]	-	-	-	-	-	-	
phenanthrene	mg/l	0.235[c]	-	ND	ND	-	-	-	
Trace Metals									
Ag	mg/l	-	< 0.050 - < 0.87[d]	-	0.001 - 0.152[e]	-	-	< 0.01 - 0.01	(Ref. 1)
As	mg/l	-	-	-	< 0.005 - 0.05[e]	-	-	< 0.01 - < 0.02	(Ref. 1)
Cd	mg/l	-	0.028 - < 0.044	-	< 0.025 - 0.056[f]	-	-	< 0.02 - 0.103	(Ref. 1)
Cr	mg/l	-	< 0.13 - < 0.25	0.260	< 0.059 - 0.390[f]	-	-	< 0.10 - 0.23	(Ref. 1)
Cu	mg/l	-	< 0.091 - 0.014	-	< 0.025 - 0.137[f]	-	-	< 0.10 - 0.28	(Ref. 1)
Hg	mg/l	-	-	-	< 0.0003 - < 0.001[e]	-	-	< 0.001 - 0.13	(Ref. 1)
Mn	mg/l	-	-	-	-	-	-	-	(Ref. 1)
Ni	mg/l	-	0.13 - < 0.25	-	< 0.068 - 1.674[f]	-	-	< 0.10 - 0.44	(Ref. 1)
Pb	mg/l	-	< 0.50 - < 1.2	0.597	< 0.16 - 0.915[f]	-	-	< 0.01 - 0.22	(Ref. 1)
Zn	mg/l	-	0.028 - 0.32	0.350	< 0.025 - 0.640[f]	-	-	0.10 - 0.27	(Ref. 1)

Notes:

[a] By GC-MS (gas chromatography-mass spectrometry); all values are averages of results derived by internal standard and isotope dilution determination.
[b] Above detection limit at two platforms.
[c] Above detection limit at one platform.
[d] By standard addition AAS (atomic absorption spectrometry).
[e] By flameless AAS.
[f] By plasma emission spectrometry.
[g] Detected in three of six platform effluents.

ND-not detectable at 1μg/l.

Source: Artic Laboratories et al., 1983.

References:

1. Train et al., 1976.
2. Radian Corporation, 1982 (six Gulf Coast platforms).
3. Lysyj, 1982 (six Gulf Coast platforms).
4. Mors et al., 1982.

Table IV-33

M Scenario Estimates of Effluent Discharges Due to Increased OCS Activities as a Result of Central Gulf Sale 104

Year	Barrels of Produced Waters (billion)	Exploration and Delineation Derived		Platform Derived Domestic and Sanitary Wastes (gal/day)	Sediment Disturbed by by Pipelaying Activities (yd^3)
		Drill Cuttings (yd^3)	Drilling Muds (bbl)		
1986	- -	-	-	-	-
1987	- -	5,110	45,500	-	-
1988	0.000003 - 0.00027	10,220	91,000	2,900 - 5,500	4,600 - 12,000
1989	0.000015 - 0.00135	17,885	159,250	5,800 - 11,000	9,200 - 24,000
1990	0.000038 - 0.00342	35,770	318,500	11,600 - 22,000	13,800 - 35,000
1991	0.000075 - 0.00675	40,880*	364,000*	20,300 - 33,000	92,000 - 240,000
1992	0.000135 - 0.01215	25,550	227,500	29,000 - 55,000	27,600 - 72,000
1993	0.000150 - 0.01350	17,885	159,250	37,700 - 71,500	142,600 - 372,000
1994	0.000165 - 0.01485	12,775	113,750	43,500 - 82,500	23,000 - 60,000
1995	0.000180 - 0.01620*	7,665	68,250	49,300 - 93,500	18,400 - 48,000
1996	0.000165 - 0.01485	7,665	68,250	52,200 - 99,000	151,800 - 396,000
1997	0.000135 - 0.01215	2,555	22,750	55,000 - 104,500	9,200 - 24,000
1998	0.000120 - 0.01080	-	-	58,000 - 110,000*	9,200 - 24,000
1999	0.000090 - 0.00810	-	-	58,000 - 110,000	4,600 - 12,000
2000	0.000075 - 0.00675	-	-	58,000 - 110,000	-
2001	0.000060 - 0.00540	-	-	58,000 - 110,000	-
2002	0.000045 - 0.00405	-	-	58,000 - 110,000	-
2003	0.000030 - 0.00270	-	-	58,000 - 110,000	-
2004	0.000015 - 0.00135	-	-	58,000 - 110,000	-
2005	0.000004 - 0.00036	-	-	58,000 - 110,000	-
2006	- -	-	-	58,000 - 110,000	-
Totals	0.0015 - 0.135	183,960	1.64 M**	58,000 - 110,000	0.506 - 1.32 M**

* denotes peak year amount.
** denotes million.

discharge. However, as a result of treatment prior to discharge as is required through USEPA's NPDES discharge permitting program, when combined with seawater these constituents are quickly diluted.

During the course of exploration drilling and workover phases resulting from the proposed action, the discharge of drilling fluids, cuttings, and sand will degrade the quality of the waters surrounding the proposed new platforms. Drilling fluid/cutting discharges will be continuous or bulk. Continuous discharges may come from the solids control equipment on each platform, while bulk discharges (commonly known as active mud discharges or mud tank dumps) are discharges of large volumes of fluids and cuttings (16 to 190 m^3), at rates of discharge (80 to 110 m^3/h) and lasting for a period of 20 minutes to 3 hours (Mors et al., 1982; Petrazzuolo, 1981). Concern has been expressed regarding the effects of drilling muds and cutting discharges on the marine environment. Based on the findings of NAS (1983), Symposium (1980), Neff (1981), Petrazzuolo (1981), Menzie (1982), and others, their results suggest that the environmental risk of exploratory drilling discharges to most OCS marine communities are small. More than 96% of the whole drilling fluids tested in short-term experiments are classified as "slightly toxic" or practically "nontoxic." Toxicity does not seem to be a problem at the concentrations of material found at distances greater than 200-500 m from the discharge point, and not at distances greater than 1,000 m. Much of the toxicity of the mud aqueous faction of drilling fluids appears to be attributable to volatile organic components, which may include petroleum hydrocarbons and by-products of lignosulfonate and lignite, whereas suspended solids may cause mortality in sensitive species and juveniles by clogging and damaging gill epithelia. Benthic infauna tend to be affected to the greatest extent by offshore drilling waste disposal, but most of the studies suggest that impacts are restricted to an area within 300-500 m of the discharge site. Although dilution is extremely rapid in offshore waters to the extent that every substance measured in the water column, including turbidity, is at background by a distance of 1,000-2,000 m, uncertainties regarding effects still exist for low energy depositional environments which experience large inputs of drilling discharges over long periods of time. For a more detailed discussion of drilling fluid/cutting discharges on the marine environment, see Section IV.A.4.a.

Produced water is by far the largest quantity of waste to be discharged during normal oil and gas operations resulting from the proposed action. The majority of these waters will be discharged directly to the surface waters surrounding the individual platforms; however, in more sensitive areas and in some instances they may be piped ashore and treated for further disposal below ground, on land, or into coastal waters. The effects of produced waters on marine flora and fauna have been examined in laboratory bioassays and several case studies of existing production fields. Concern has been expressed regarding the individual synergistic and antagonistic effects of the various constituents of these waters, but the separation of components effects has not been possible in either case studies or bioassays. In production field case studies, the discharges of other wastes such as drilling fluids and deck drainage has complicated delineation of the source of trace metals and hydrocarbons while there have been no laboratory studies which identify the cause of produced water toxicity. Regional variations in the content of the produced water, as well as temporal changes in its composition during the life of a given well, have also complicated investigations on the effects of this production waste. The published literature indicates that produced waters and brine are only slightly toxic (1%-10%) to practically nontoxic to most marine organisms, using those standards commonly cited for describing acute toxicity (Rose, 1981). The limited toxicity data available for juvenile and larval stages of shrimp and fish suggest, however, that immature individuals may be more sensitive than adults to the effects of produced waters. The sublethal effects of produced waters have also been examined during laboratory and field investigations and generally suggest that detrimental effects would not occur at concentrations of produced waters which could be reasonably expected near the offshore discharge rates (Arctic Laboratories Limited et al., 1983).

In contrast to the lack of laboratory bioassay data, the effects of produced water have been examined in several case studies of offshore production areas; the most detailed of these have been completed in the Gulf of Mexico. Of those conducted within the Gulf, the only significant affects on biota to be documented occurred when produced waters were discharged into shallow bays and estuaries. Mackin (1973) reported that produced water discharges totally destroyed the benthic community within 15 m of the discharges in a shallow (2.4 m) Texas estuary. Some mortality was observed at a distance of 91 m; however, a zone of increased productivity was found from 122 m to several thousand meters from the discharge. Based on studies conducted in Trinity Bay, Texas (Armstrong et al., 1979, cited in Goodman and Troake, 1982), no benthic organisms survived within a 15 m radius of the produced water discharge in water depth of 2-3 m. Low benthic biomass extended to a distance of 150 m from the outfall; no adverse effects were observed at 455 m.

Concentrations of trace metals in produced waters typically exceed those concentrations found in seawater by an order of magnitude or more (Tables IV-30, IV-31, and IV-32). In a review of environmental aspects of produced waters, Koons et al. (1977) cite an increasing body of evidence which indicates that natural processes reduce the activity and toxicities of trace metals dissolved in seawater as a result of binding with organic substances. The low toxicity of trace metals is substantiated by bioassay studies which indicate that most marine organisms tolerate relatively high concentrations of produced waters. However, bioaccumulation of metals and subsequent sublethal effects remain areas of potential environmental concern. The existing data, however, neither confirms nor denies the potential for bioaccumulation of trace metals.

Marine flora and fauna may be affected by several other components and properties of produced waters, including its high salinity, temperature, content of organic compounds, and low DO content; however, all investigators have agreed that rapid dilution and turbulence at the discharge point limit the zone affected by these properties (e.g., Mackin, 1973; Gallaway, 1980a; and Bender et al., 1979). Although the distance required prior to the background levels being reached will vary with volume of produced water discharged and its particular characteristics, several investigators suggest that these levels are reached within a few meters from the discharge point, even in relatively shallow waters.

Offshore water quality degradation will occur within the immediate vicinity of exploration and production sites with high impacts expected to occur within a few meters to tens of meters from the discharge source. These impacts, however, will decrease to very low with distance (500-1,000 m) from the source.

Conclusion

The overall impact to offshore water quality is estimated to be low.

Cumulative Impacts

Increased oil/gas exploration and development activities in the Central Gulf will contribute to the cumulative impacts on offshore water quality in this region. These activities, along with ocean dumping and increased vessel traffic, are among the contributions to areawide offshore water quality degradation.

Approximately 165 mobile rigs and 2,800 platforms (multiwell) currently operate in the Central Gulf Federal OCS. The addition of some 2,160 exploration/delineation wells, 1,670 development/production wells, 160 platforms, and 1,090 miles of pipelines are estimated for this area as a result of Federal OCS activity related to the proposed action (M Scenario) and prior OCS sales. This could result in the discharge of up to 1.07 billion bbls of formation waters, 9.83 million bbls of drilling muds, 1.09 million yds^3 of drill cuttings, and an average of 0.66 million gallons/day of treated sanitary and domestic wastes from platforms. Pipeline-related activities could result in the disturbance of up to some 6.5 million yds^3 of sediment.

Offshore waters will, therefore, be subject to cumulative impacts from discharges of drilling fluids, formation waters, and other effluents which add burdens of both toxic and non-toxic materials to the water column. However, the natural processes of dispersion, degradation, and sedimentation will result in immeasurably low concentrations of these materials within a few meters to a few kilometers of the discharge site, resulting in low cumulative impacts.

The following discussion of other factors which may cumulatively impact offshore water quality has been taken from NOAA's National Marine Pollution Program Plan dated 1981 (USDC, NOAA, 1981).

Dredging of new channels and maintenance dredging of existing channels are required to provide safe and efficient navigation conditions for commercial and recreational marine transportation. Channel dredging generates significant amounts of dredged material consisting of the sediment and water mixture excavated from areas dredged. On the basis of volume, dredging is the largest single source of material that is ocean dumped. During 1979, more than 72 million cubic yards of dredged material was deposited in the marine environment (U.S. Dept. of the Army, Corps of Engineers, 1980). Of that total, 68% was disposed of in the Gulf of Mexico. The total constituted nearly eight times the combined tonnage of industrial wastes, sewage sludge, construction debris, and other waste materials disposed of in the marine environment during 1979 (U.S. Dept. of the Army, Corps of Engineers, 1980). Compared with other materials that are disposed of in the ocean, most of the dredged material excavated in the United States is relatively innocuous, in many instances containing no harmful pollutants and, in most of the remaining cases, containing only trace levels of contaminants. In these cases, the primary concern associated with disposal of the relatively innocuous materials centers around the direct physical effects of disposal. These physical effects include burial of organisms, increased levels of suspended sediments, and accretion of disposed materials (U.S. Dept. of the Army, Corps of Engineers, 1978). However, dredged material taken from highly polluted areas is usually contaminated with harmful chemical constituents such as heavy metals, synthetic organics, and oil and grease. Open-ocean disposal of these materials carries the threat of acute or chronic toxic effects on marine organisms, and potential contamination of human food resources. Much research has been conducted to describe the effects of dredged material disposal in the marine environment, and to evaluate disposal options that may be preferable to ocean dumping.

Industrial wastes may contain potentially harmful constituents including synthetic organics, heavy metals, and oil and grease. Commonly used disposal options for industrial wastes are secure landfills, ocean dumping, pipeline discharges to coastal and inland waters, and incineration. When industrial wastes are ocean dumped, the waste materials are barged to a designated disposal site and discharged. Between 1973 and 1978, some 2.6 million tons of industrial wastes were dumped into the Gulf of Mexico; however, there has been a trend toward reduction of total ocean dumping of industrial wastes since 1973 when ocean dumping became regulated by the Federal Government and industrial waste dumping has been totally eliminated in the Gulf of Mexico.

The first incineration at sea of chemical waste officially sanctioned in the U.S. occurred in the Gulf of Mexico between October 1974 and January 1975 when M/T Vulcanus incinerated 16,000 metric tons of organo-chlorine wastes at a designated site about 140 nautical miles southeast of Galveston, Texas (U.S. Environmental Protection Agency, et al., 1980). In 1977, 17,600 tons of chemical waste were incinerated in the Gulf of Mexico. From studies of these early burns, it has been concluded that incineration at sea for organic chemical wastes does not cause unacceptable environmental consequences, at least on a limited basis for some chemicals and at these specific sites (U.S. Environmental Protection Agency, et al., 1980). Candidate wastes for incineration at sea are generated primarily by the following industries: petroleum refining, organic chemical production, synthetic fibers and resins manufacture, and pesticides production. Although incineration at sea has been conducted on a limited basis, it is likely to become more common in the future. Increasing amounts of industrial waste are produced each year, and increased regulatory pressure through implementation of the Resource Conservation and Recovery Act (RCRA) is eliminating some of the traditionally used land-based disposal options because of potential environmental hazards.

Contaminants from marine transportation activities enter the sea intentionally as a result of routine operational discharges, and unintentionally as a result of accidental spills. Vessel sizes and designs are as varied as their functions. They range from small recreational craft used primarily in coastal waters to defense-related naval vessels and ships of the merchant marine fleet up to several hundred thousand tons in size. With respect to ships that maintain sizeable crews, the pollutants are the large amounts of domestic waste products such as sewage, food waste, and trash from the human activities on board. For recreational vessels, sewage disposal from marine sanitation devices in highly populated, confined harbors and anchorages is the primary pollution concern. Other problems are related to the movement of crude oil and concern offshore unloading terminals (deepwater ports) and identification of systems most reliable for transfer of oil from OCS production areas to shoreside facilities.

Perhaps the most publicized source of pollution is operational discharge of oil by tankers in the merchant marine fleet. Because tankers cannot safely navigate ocean waters with empty tanks, they take on seawater as ballast after the cargo is discharged. When a ship gets close to its loading destination, the ballast water is discharged to make room for the oil cargo. Thus the ballast seawater, contaminated with oil from the previous cargo or from tank washing, is sometimes intentionally discharged into the ocean. Regulation, coupled with the increased value of oil, has led to development of new and better techniques such as segregated ballast, crude-oil washing systems, and oil/water separation systems for minimizing contamination of ballast water. Nevertheless, enforcement of regulations and standards is still a problem.

Oil spills are one of the most highly visible forms of ocean pollution. Recently, it has been recognized that spills of hazardous materials may, in many cases, pose a more serious threat to marine ecosystems than oil spills. Substantial amounts of oil and hazardous materials enter the marine environment as a result of accidental spills. Although the focus in the past has been on the cleanup and mitigation of spilled oil, national concern has been shifting toward hazardous materials as the cause for most immediate concern. Much has been learned in the past 10 years about how to respond to oil spills; far less is known for oil spills of hazardous material. Unlike oil, whose properties are fairly uniform, hazardous materials have a wide variety of physical and chemical forms, complicating and making much more difficult the response necessary for their cleanup and disposal. Methods for the cleanup and mitigation of hazardous materials are not well established.

Between 1946 and 1970 the Atomic Energy Commission (AEC) licensed the dumping of more than 86,000 containers of low-level radioactive wastes at 28 recorded dumpsites in the Atlantic and Pacific Oceans and the Gulf of Mexico. Of these, only two dumps were made in the Gulf of Mexico (U.S. Environmental Protection Agency, 1980). Ocean dumping was discontinued in June 1970 following a policy recommendation by the President's Council on Environmental Quality (CEQ) in its 1970 report to the President. The United States has never disposed of its high-level wastes in the oceans, and in 1972 two major legislative initiatives were enacted prohibiting future disposal of high-level wastes into coastal waters and rivers. The Ocean Dumping Act, in addition to regulating ocean disposal of low-level waste, prohibits the dumping of high-level waste and radiological warfare agents in ocean waters. Soon after the Ocean Dumping Act was enacted, the Clean Water Act was amended to extend the prohibition to all navigable waters. Although not immediately contemplated, subseabed emplacement of high-level radioactive wastes is a future option.

A concentrated brine solution needing disposal results from the development and operation of salt dome storage cavities associated with the Strategic Petroleum Reserve Program (SPRP). Mandated by the Energy Policy and Conservation Act of 1975 (42 U.S.C. 6201 et seq.), SPRP is intended to help protect the United States from severe disruptions in the world oil supply by stockpiling crude oil. The brines are normally discharged into the Gulf of Mexico through diffusers to promote rapid dilution to background salt concentrations. However, the brines are denser than seawater and tend to flow along the seafloor, affecting bottom-dwelling organisms until sufficient dilution has been achieved. In addition, hydrocarbons and other harmful constituents may be dissolved in or entrained with the brine discharge. Brine discharges are regulated by the EPA under NPDES.

Conclusion

The overall cumulative impacts, which include the effects of non-OCS-related factors, can be expected to be very high.

(b) Onshore

The construction and operation of onshore facilities supporting OCS activities in the Gulf may impact local onshore water quality by increasing the number of point and nonpoint pollution sources. Increases of nonpoint waste sources due to site runoff may contribute particulate matter, heavy metals, petroleum products and chemicals to local streams, estuaries, and bays, causing temporary elevations in pollutant and turbidity levels. During site preparation the vegetation is cleared from the area, the topsoil is exposed, and the soil profile is altered by grading and leveling operations. The soil is compacted by the constant movement of heavy machinery, which in turn alters the retention properties of the soil and gives rise to increased erosion and runoff from the site. By controlling the erosion generated within the construction site boundaries, several of the adverse impacts can be localized and prevented from having offsite impacts on water bodies.

Land clearing and associated development changes the natural process of stormwater runoff, causing the volume and rate of runoff to increase as the natural vegetation is modified. Two major pollutants are contained in this runoff--suspended solids (organic and inorganic) from exposed soil at the site and contaminants such as heavy metals. Suspended solids may significantly decrease light penetration in water, thereby decreasing photosynthesis in aquatic plants. These may also cause abrasive injuries and gill clogging in fish and can smother eggs and larvae on the bottom. They may provide additional substrates for bacterial decay, leading to oxygen depletion of bottomwaters. Alternately, they may contain nutrients which increase growth rates of endemic plant and animal populations.

Impacts of heavy metals or other contaminants contained in runoff on receiving waters will depend upon two factors. The first is the nature of the runoff and the level of concentration of heavy metals. The second factor is the nature of the receiving waters and the species diversity. Some heavy metals are extremely toxic, even in low concentrations, while others have a cumulative effect as organisms ingest them. As in the case of shellfish water quality, changes may not kill the resource but may contaminate it so that it cannot be safely used for a human food source or taints the flavor of the source, making it undesirable for human consumption. These metals may also exhibit a toxic effect on consuming organisms higher in the food chain due to concentration increases with each step in the food chain (NERBC, 1976).

Increases of point source discharges may also contribute to effluent discharges of domestic wastewater, cooling and boiler water, process water, and in marine terminal areas, the discharge of ballast and bilge water. The following discussion on wastewater effluents discharged to surface waters by OCS-related support facilities is largely taken from NERBC (1976).

Wastewater effluents from OCS-related support facilities are commonly discharged to surface waters after treatment. Although the degree of environmental damage, if any, will be related directly to the toxic nature of the discharge and the biota in the receiving waters, certain characteristics of the discharge zone are important. These include: the size of the effective mixing zone (dilution factor) or the ratio of discharge volume to receiving volume; the flushing rate of residence time (estuaries characteristically have a slow flushing rate); and the physical-chemical characteristics of the receiving waters, e.g., marine waters have a higher buffering capacity than fresh or estuarine waters.

Cooling water represents a significant proportion of the wastewater effluent from an oil refinery. Substances concentrated in the blowdown and heat added during the condenser cooling operations could produce serious impacts on the receiving waters. Chemicals added to the cooling water stream to reduce corrosion and fouling within the tower and the condenser system (including chromium and chlorine) may be extremely toxic to aquatic organisms. The presence of these substances could increase any adverse impacts of heated discharge on the receiving water body.

Domestic wastewater from support facilities will be collected and delivered to a municipal treatment plant or will receive secondary treatment in an onsite package treatment plant that includes chlorination prior to discharge to the receiving waters. Should these receiving waters also contain high organic carbon concentrations, organic chlorine compounds (e.g., chloroform, chloramines) which are highly toxic to certain aquatic organisms will be produced. Discharge of properly treated sewage wastewater into urban harbors is not expected to measurably degrade the receiving waters.

Although it does not constitute the greatest volume of water used in refining operations, process water may be the most contaminated. The processing pollutants are added during crude oil desalting, steam distillation, steam stripping, etc. In general, the quantity and hazardous nature of process water is a function of the size of the facility (in terms of barrels/day) and the degree of processing. Process water discharged from plants is of considerable volume and is highly toxic due to its anaerobic and highly reduced character and the presence of numerous heavy metals, sulfides, and ammonia which were produced together with the oil and gas. Three substances--mercury, cadmium, and cyanide--present in the effluents of OCS support facilities have been designated "toxic pollutants" pursuant to the Federal Water Pollution Control Act, as amended. Toxic pollutants are defined in Section 502(13) as "those pollutants, or combinations of pollutants, including disease-causing agents, which after discharge, and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will, on the basis of information available to the Administrator, cause death, disease, behavioral abnormalities (including malfunction in reproduction) or physical deformations in such organisms or their offspring."

Wastewater effluents from OCS-related facilities produce a wide range of responses in the receiving waters. Environmental responses produced will depend upon the quantity and kind of pollutants discharged or spilled. Heavy metals (such as zinc or copper), although often essential or nontoxic to organisms in very low concentrations, become toxic in higher concentrations. Even if the concentration of a heavy metal in the water is not toxic, it may accumulate in tissues with ultimately lethal effects. Ammonia can alter the pH of water, thus harming pH-sensitive organisms. Antifouling substances, which are added to cooling water to kill algae and bacteria, have similar effects on the organisms present in the water into which they are discharged. Suspended solids significantly decrease light penetration into the water, thus decreasing photosynthesis in aquatic plants. They also cause abrasive injuries and gill clogging in fish and can smother eggs and larvae by blanketing a stream bottom. Suspended solids which settle on the streambed provide additional substrates for bacterial decay, leading to oxygen depletion of the bottom waters. Thermal discharges can alter the chemical nature of receiving waters in many ways. Solubility of dissolved oxygen, toxicity of heavy metals, and metabolic rates of aquatic organisms are affected by changes in water temperatures.

The environmental impacts associated with oil and heavy metal pollution in the marine environment include both toxic and sublethal responses. Juvenile forms of many species of marine fauna are particularly sensitive, and an age class may be totally eliminated by a specific dosage of oil or some heavy metal. Sublethal physiological alterations include depression of growth and photosynthesis in marine flora.

Point source discharges will be subject to treatment by municipal and industrial facilities in compliance with Federal and State discharge permit requirements. NPDES permits are issued on a facility-by-facility basis, limiting the quantities of contaminants in and the temperature of each facility's effluent. These limits reflect a site-by-site specific analysis of flushing and mixing zone rates of the receiving body and indigenous population's ability to tolerate elevations of temperature and pollutant concentrations.

In April 1982, a report was released to the Office of Ocean Resources Coordination and Assessment (ORCA) of NOAA and was entitled "The Discharge of Water Pollutants from Oil and Gas Exploration and Production Activities in the Gulf of Mexico Region" by Gianessi and Arnold. This report is part of a larger assessment effort of the Gulf of Mexico by NOAA's National Ocean Service, Strategic Assessment Branch. This office has recently completed data gathering efforts for a Gulf of Mexico Data Atlas, which contains information on the physical and living environments, species, economic activities, and jurisdictions within the Gulf. The purpose of this report was to estimate the water pollutant discharges resulting from oil and gas exploration and production activities in the Gulf of Mexico region for a representative current year. The report stated that in addition to the produced water discharged directly to OCS waters (356,642 bbls/day), in 1976 OCS operators piped some 328,470 bbls of OCS produced waters per day to onshore locations where it was treated and subsequently discharged in inshore waters. Aside from OCS discharges of produced waters, it was also noted that approximately 840,000 bbls of salt water are discharged per day in Louisiana coastal parishes and up to 700,000 bbls of brine per day are permitted for disposal to surface waters in Texas coastal counties.

Discharge of produced waters from normal oil and gas operations on the OCS are covered by OCS Order No. 7 which requires that all such discharges must meet USEPA permitting procedures pursuant to the Federal Water Pollution Control Act, as amended. The USEPA standard allows for a daily maximum oil and grease discharge of 72 mg/l. Brine discharges to surface waters in Louisiana are regulated for oil content by the Division of Water Pollution Control and oil/grease permit concentrations are set at 30 mg/l and are assumed the same for produced water discharges into Louisiana tidal waters. Brine discharged into Texas tidal water requires a permit from the Texas Railroad Commission and sets a limit on the daily water production by discharge point and an average of 15-25 ppm oil content.

Impact Analysis

Onshore water quality degradation will occur as a result of increased nonpoint and point sources of pollution, especially in those areas of Louisiana (Calcasieu Basin, Mississippi Delta), Mississippi (Pascagoula area), and Alabama (Mobile Bay) where water quality problems already exist. Impacts to onshore water quality will occur as a result of runoff from construction and operation of onshore facilities supporting expanded OCS activities in this region. The construction of up to 60 miles of onshore pipeline in C-1 (0-20), C-2 (0-20), and C-3 (0-20) and up to one (0-1) new service base in C-4 will create non-point source increases in surface runoff to nearby streams and rivers. Non-point source impacts may be minimized by controlling erosional effects generated within construction site boundaries, with several of the adverse impacts being localized and prevented from having offsite impacts to water bodies in the vicinity of these activities. Any increase beyond normal background levels would be temporary and of a limited duration. Point source increases would also occur from effluent discharges related to OCS-support activities, primarily the 0-1 new service base; however, any potential adverse impact can be mitigated by Federal and State water pollution control regulations and permitting.

As was shown, produced waters which are piped ashore are subject to treatment prior to discharge, according to Federal and State regulations and permitting requirements. However, it should be noted that this treatment is only used in the extraction of oil and grease contaminants. These waters may, therefore, contain high concentrations of TDS, oxygen demanding wastes, toxic heavy metals, aromatic hydrocarbons, and environmentally high levels of radionuclides. In open ocean situations the discharge of these components appears to contribute minor impacts to the surrounding discharge area; however, in shallow semi-enclosed estuarine environments, impacts could be extremely high depending on the physical and biological components of each system. Additional information on location of discharge sites, daily discharge rates at each site, and the nature of the environment (background levels, etc.) in each area will be needed to determine the extent of impacts, if any.

Although onshore water quality impacts are estimated to be low, effluents discharged in connection with OCS-support facilities, suggested as having little or no impact, may be extremely damaging when released into sensitive habitats having a reduced capacity for pollution assimilation.

Conclusion

The overall impact to onshore water quality is estimated to be low.

Cumulative Impacts

Increased oil/gas exploration and development activities in the Central Gulf will contribute to the cumulative impacts on onshore water quality in this region. These activities along with current and future activities associated with State tidelands' oil and gas operations, industrial and municipal waste discharges, ocean dumping, and increased vessel traffic are among the contributions to areawide water quality degradation.

Approximately 70 platforms (multiwell) are currently operating in the Central Gulf State waters (1985). An unknown number of additional structures may be constructed as a result of resource development in State-owned coastal waters. The construction of several additional pipelines from existing lease blocks in both Federal and State waters may occur in the future as a result of increased development activities in these areas. Pipeline-related activities resulting from prior OCS sales could result in the disturbance of some 2.0-5.2 million yds^3 of sediment. The addition of 3-15 new service bases, possibly 1 new pipe coating yard, 2-3 new pipeline landfalls, up to 260 miles of pipeline, up to 2 new platform fabrication yards, and up to 3 new gas processing plants are estimated as a result of the proposed action and prior OCS sales in the CPA. Onshore water quality degradation will occur as a result of increased nonpoint and point sources of pollution associated with the construction and operation of this new onshore infrastructure.

Nearshore waters will therefore be subject to cumulative impacts from discharges of drilling fluids, formation waters, and other effluents which add burdens of both toxic and non-toxic materials to the water column. However, the natural processes of dispersion, degradation, and sedimentation will result in immeasurably low concentrations of these materials within a few meters to a few kilometers of the discharge site, resulting in low cumulative impacts.

The following discussion of other factors which may cumulatively impact onshore water quality has been taken from NOAA's National Marine Pollution Program Plan dated 1981 (USDC, NOAA, 1981).

Industrial ocean outfalls are pipeline discharges of industrial wastes that directly enter estuaries, coastal waters, or oceans. Ocean outfalls of industrial wastes are regulated by USEPA through NPDES. In 1979, more than 5,000 NPDES permits were held for pipeline discharges by industries in coastal counties. In addition, about 7,500 operational discharges were associated with offshore oil and gas facilities. Pollutants that may be associated with various industrial effluents include synthetic organic, heavy metals, oxygen-consuming materials, suspended solids, and nutrients.

Historically, the Nation's rivers, estuaries, and coastal waters have received municipal waste discharges since collection and treatment of domestic wastes was initiated. Prior to the 1970's, ocean disposal was largely unregulated, and adverse impacts on human health and the environment were observed. The principal hazards to human health from sewage waste disposal are associated with the transmission of human pathogens and the ingestion of seafoods contaminated with toxic metals and synthetic organic compounds. Food poisoning, dysentery, and transmission of a variety of human and animal parasites are commonly associated with the discharge of untreated sewage waste. Other adverse impacts are the loss of recreational and commercial resources where beaches or wetlands are fouled with floating waste materials or are closed to fishing and shellfishing because of sewage contamination.

Although major attention is given to these highly visible accidents, substantial amounts of oil and hazardous material enter the marine environment through far less spectacular means. Spillage during loading and unloading operations in ports and harbors, pipeline leakage, equipment failures, spills from land vehicles and storage facilities onshore are all sources and causes of accidental discharges that eventually enter the marine environment. Oil contained in urban and river runoff (spent oil and grease that wash from the streets and sewers of cities) are major contributors to the oil content of the oceans. About 35% of the total annual oil pollution added to the seas is a result of accidental discharges from oil transportation (by tankers, pipelines, barges, etc.) (NAS, 1981). A small amount enters from OCS activities (less than 2%). The remainder enters from coastal facilities and wastes, land runoff, and natural seeps.

The operation of some coastal facilities can result in large accidental spills, or chronic unintentional discharges of harmful substances into coastal waters. For example, it is estimated that, on the average, each fueling of a pleasure craft at a recreational marina results in the spillage of one fluid ounce of gasoline or diesel fuel (Richardson et al., 1975). Oil and grease also enter the waters around a marina in bilge discharge and as a result of lubrication and maintenance. The effects of chronic discharges may become locally important in areas where coastal facilities occur at high densities, or when major portions of the coastal area are affected.

Nonpoint source pollution is among the most challenging of water pollution problems. In contrast to the important progress made during the 1970's in controlling industrial point source discharges and in upgrading municipal sewage treatment facilities, progress with nonpoint sources is negligible (CEQ, 1980). The distinction between point and nonpoint sources of water pollution is not always clear. Point sources generally discharge into surface waters through a discrete pipe, outfall, or ditch, and nonpoint sources generally discharge in a more diffuse way, for example, land runoff. Nonpoint source pollution is primarily the result of precipitation falling and moving over and through land and into surface water bodies. In some cases nonpoint source pollution is the result of human practices, for example, irrigation. All land use activities are potential nonpoint sources of pollution. Nonpoint sources of pollution are classified as urban and non-urban runoff. Urban runoff occurs in areas of relatively high population density that are largely impervious to water because of the large area covered by roads, sidewalks, parking lots, and buildings. Non-urban runoff occurs in all land areas other than urban, such as agricultural lands, animal feedlots, pasture land, and forest land. Non-urban areas are more pervious than urban areas and absorb a higher percentage of precipitation into the soil. The effects of nonpoint sources on water quality can be significant, depending on the annual hydrologic cycle and the types of land uses within a region. Estuaries and adjoining coastal areas may be particularly affected. Nearly the entire United States is drained by river systems that eventually discharge into coastal waters. Depending on the pollutants and the characteristics of the river system they enter, various amounts of nonpoint source pollutants are ultimately discharged into coastal waters. Water pollution from nonpoint sources is estimated to affect about 90% of the drainage basins in the United States (U.S. Environmental Protection Agency, 1978a). Pollution discharges from nonpoint sources greatly exceed the discharges from point sources. In fact, it has been concluded (U.S. Comptroller General, 1977) that national water quality goals cannot be achieved without some control of nonpoint source pollution.

Other factors considered to cumulatively impact nearshore and onshore waters include the discharge of dredge materials, industrial waste discharges, vessel discharges, and oil spills. These are discussed under the cumulative section for offshore water quality.

Conclusion

The overall cumulative impacts which include the effects of non-OCS-related factors can be expected to be very high, primarily in those highly urbanized and industrialized coastal areas currently experiencing water quality problems.

(4) Impacts on Air Quality

The major impact producing factors on air quality from OCS-related activity are due to the combustion of raw material, evaporative losses, internal combustion related to power generation, and refinery/processing techniques. The major impact producing factors from offshore and onshore OCS-related activity are:

Offshore Activity

Catastrophic Events
- blowout with fire
- oil spill (major)
- release of sour gas (nonflared blowout)

Operations Emissions
 exploration drilling
 platform installation
 development drilling
 oil production
 gas production
 barge loading (where applicable)

Onshore Activity

Refineries
Gas Processing Plants

The effects that major impact producing factors have on the identified resource, coastal ambient air quality, can be put into two groups: (a) those effects of an immediate nature and (b) long-term effects. Effects of an immediate nature are those caused by catastrophic events such as blowouts with fire, major oil spills, or the release of free hydrogen sulfide (sour) gas. Air emissions from these sources are of a nonroutine nature and can be expected to last for a short period. However, due to the release of large quantities of hydrocarbons (in the case of an oil spill), nitrogen oxides (NO_x), sulfur oxides (SO_x), carbon monoxide (CO), total suspended particulates (TSP), and volatile organic compounds (VOC) (in the event of blowout with fire), and hydrogen sulfide gas (from blowout-no-fire-in sour gas prone areas), effects that are of an immediate nature are likely to occur and in some instances could result in serious health hazards. A factor influencing the effects of such events is the volume of hydrocarbons released, the rate of release, and the distance to shore. Events that could occur on the OCS range from a minimum of 3 miles to as far as 200 miles from shore.

Other emissions due to offshore and onshore OCS-related activity create effects of a more persistent nature. Operational emissions from offshore activity and onshore activities such as refineries, and gas processing plants typically emit constant levels of VOC, NO_x, CO, HC, SO_x, and TSP. The levels of these emissions are typically not extreme; thus, it is the effect of these emissions on the ambient air quality that is of concern. If normal emissions from these sources degrade the air quality of any onshore area such that the NAAQS are exceeded, and if the emissions further degrade the air quality of a designated nonattainment area, then a threat exists to the health and welfare of the affected area since the primary and secondary standards set up under the NAAQS are specifically designed to protect the public health and welfare, respectively. Although all criteria pollutants may cause serious health hazards in high concentrations, they also cause less serious health hazards at lesser concentrations such as eye and nose irritation, pulmonary discomfort, irritation to the respiratory tract, broncoconstriction, and irritation to emphysema patients.

The following is a breakdown of definitions of expected levels of impacts related to air quality. Note that these are keyed to ambient levels of criteria pollutants and further relate to hazards to public health and welfare via the primary and secondary NAAQS. Significant concentration levels relative to these definitions are detailed in Tables IV-39, IV-40, and IV-41 of the Final Regional EIS.

Very High	- Offshore or onshore sources significantly increase levels of criteria pollutants such that nonattainment areas will be degraded further or attainment and PSD areas are significantly degraded.* Significant effects on public health and welfare are expected.
High	- Offshore or onshore sources increase levels of criteria pollutants such that nonattainment areas are likely to be degraded to a small extent or attainment and PSD areas are likely to degrade.* Likely to pose hazards to public health and welfare.

Moderate - Offshore or onshore sources increase levels of criteria pollutants such that nonattainment areas are not likely to be degraded further and attainment and PSD areas are not likely to degrade significantly.* Unlikely to pose hazards to public health and welfare.

Low - Offshore or onshore sources increase levels of criteria pollutants such that nonattainment areas are very unlikely to be degraded further and attainment and PSD areas are likely to undergo only very small increases in levels of criteria pollutants.* Very unlikely to pose hazards to public health and welfare.

Very Low - Offshore and onshore sources increase levels of criteria pollutants such that nonattainment areas are very unlikely to be degraded further and attainment and PSD areas are likely to undergo negligible increases in levels of criteria pollutants.* Does not pose any hazard to public health and welfare.

*Note that levels of degradation of PSD areas are relative to whether they are a Class I, Class II, or Class III area; i.e., very small changes in pollutant levels are considered significant for Class I areas. (Refer to Tables IV-39, IV-40, and IV-41 of the Final Regional EIS for significance levels relative to the above definition and PSD areas.)

Impact Analysis

The ambient air quality in the CPA is generally considered better than the national standards with violations of the NAAQS occurring in some coastal areas; these areas where violations occur are designated as nonattainment areas. Additionally, there is one PSD Class I area in the coastal region (Breton Wilderness Area) whereby a small amount of degradation to ambient air quality is considered significant. All nonattainment and PSD Class I areas in the CPA are identified below:

St. John the Baptist, Louisiana
  Nonattainment - Primary - O_x
Orleans, Louisiana
  Nonattainment - Primary - O_x
Jefferson, Louisiana
  Nonattainment - Primary - O_x
St. Bernard, Louisiana
  Nonattainment - Primary - O_x
St. Charles, Louisiana
  Nonattainment - Primary - O_x
Lafourche, Louisiana
  Nonattainment - Primary - O_x
St. Mary, Louisiana
  Nonattainment - Primary - O_x
Mobile, Alabama
  Nonattainment - Primary - O_x
    Primary and Secondary TSP
St. Bernard/Plaquemines, Louisiana
  PSD Class I - Breton Wilderness Area

Onshore, it is expected that no new gas processing plants and no new crude oil refineries will be needed to handle additional needs. Offshore, 360 exploration and delineation wells, and 200 development wells are estimated to be drilled and 20 additional production platforms utilized.

Catastrophic events such as major oil spills and blowouts have the potential to create localized air quality problems. Table IV-42 of the Final Regional EIS shows that a major oil spill (10,000 bbl magnitude of light crude) could emit 570,000 lbs/hr of hydrocarbon the first hour and 290,000 lbs/hr the second hour. As discussed in Section IV.B.3. and as shown in Table IV-20 of the Final Regional EIS, 45% of a spill is expected to be lost due to evaporation of hydrocarbons over the first 10 days. In the Central Gulf, one major oil spill greater than 1,000 bbls is expected to occur as a result of the proposed action. Degradation of onshore air quality is not expected due to this oil spill. The probable distance from shore (more than 3 miles and very likely farther), rapid dispersion or breakup associated with oil spills, and the turbulent variable surface winds offshore are natural conditions that minimize oil spill effects. Rapid dispersion of evaporative emissions from these sources is expected. There is a possibility that a major spill occurring near land under ideal conditions (steady onshore winds, persistent spill) could cause short-term onshore air quality degradation. If this were to occur adjacent to a nonattainment or PSD Class I area, this short-term degradation would be more serious than if it occurred elsewhere.

Blowouts, also being nonroutine events that may persist for many days or weeks, emit substantial levels of THC, NO_x, SO_x, CO, and TSP when associated with fire. These emissions can be considered a point source and have the potential of dispersing over land areas under certain circumstances; this, of course, depends on the location of the event and wind conditions. Emissions from these sources further offshore have little potential of degrading onshore air quality; however, if such an event were to persist nearshore for some time, it may degrade onshore air quality to an unknown level (assumed to be low to moderate). If these events affect any nonattainment area or PSD Class I area, the consequences would be more serious than if it occurred elsewhere.

An unflared blowout in an area where sour gas exists could present serious health hazards within a radius of approximately three miles from the source. Concentrations of H_2S in excess of 400 ppm for 30-minute or less exposure are considered dangerous to humans and 700 ppm is estimated to be fatal to humans. Should an event occur, H_2S content of gas, local wind conditions, and other factors would control the impacts of the event. Uncontrolled emissions of this nature are unlikely to cause hazards onshore if the source is farther than approximately 4-5 miles offshore.

In the summer of 1984, two sour gas finds were publicly reported 3-5 miles south of Dauphin Island, Alabama. H_2S content was tested at 5,000 and 7,000 ppm for each exploratory well. Using these test results and assuming the most conservative (severe) conditions, a modeling effort to determine the dispersion characteristics of H_2S was undertaken. The conditions applied to the model included: (a) a blowout above the water column; (b) three miles distance from shore; (c) a steady, gentle southerly wind; and (d) a persistent 26 million cubic feet/day duration. The results of this analysis indicate less than 1 ppm H_2S would be dispersed on the island. This level would probably not be detectable by human olfactory senses and would pose no threat to human or natural environments.

Catastrophic events are not possible to predict in time and location. Effects from these nonroutine activities are highly dependent on the distance offshore, H_2S content, and proximity to a nonattainment or PSD area. Higher impacts will occur if these events affect nonattainment or PSD Class I areas.

The Alabama State Oil and Gas Board reports H_2S levels ranging from 4.3%-9% (43,000 to 90,000 ppm) from three exploratory wells in the Mary-Ann Field in lower Mobile Bay in State waters. The level of H_2S may vary greatly within short distances of less than five miles. H_2S monitoring of OCS gas exploration is an on-going program.

Operational emissions from routine offshore activities are typified as to type and amount relative to each activity displayed in Table IV-34. The amount of emissions are the result of assumed conditions stated in the note on this table.

In an attempt to estimate the amount of emissions produced as a result of Sale 104 for a peak year of activity, air emissions data were compiled for exploratory drilling and platform operations. Typical emissions for exploratory drilling are shown in Table IV-35 and are based on studies conducted by USEPA for offshore activities. Emissions for a major platform operation is presented in Table IV-36. Emissions shown in this table are based on five years of air emissions data submitted to MMS in the Gulf of Mexico by industry operators. The most commonly used equipment producing emissions is listed.

Table IV-37 displays estimated air emissions for Sale 104. Assuming the greatest impacts would result during the period of highest activity, estimates are made for the peak year. In addition to emissions for the proposed action (M Scenario), estimates are made for resources expected to be developed (but not currently producing) as a result of prior lease sales. Finally, existing platforms capable of creating air emissions are shown for the CPA with an estimate of

Table IV-34

Representative Emissions of Offshore Activity

Operational Emissions	Pollutant Emissions (tons/year)					
	VOC	NO_x	TSP	SO_x	CO	Notes
Exploration Drilling	18	180	13	12	40	Emissions valued from VCAPCD* assumes 60 days/well and 6 wells drilled near same site, i.e., constant drilling in same area over the full year.
Platform Installation	16	465	22	31	75	Emission values from ERG** assumes platform installation occurs over 9 months; includes support activities.
Development Drilling	9	240	11	21	71	Emission values from ERG** assumes 2 wells drilled at a time and 12 wells per year.

	Power Requirement
Oil Production	
Electrical Generation (oil pumping, platform electricity, miscellaneous)	5,300 hp-hr/10^3 bbls
Water Injection	3,000 hp-hr/10^3 bbls
Barge loading - 1.7 lb Hc per 10^3 gal transferred (crude oil)	
Gas Production and Processing	
Gas Compression (lift, gathering, sendout)	6,100 hp-hr/10^6 ft^3
Offshore Gas Processing (compression for heavy hydrocarbon removal, sweetening, dehydration)	3,200 hp-hr/10^6 ft^3

Note: Emissions factors for power requirements are as follows (pounds/10^3 hp-hr):

NO_x	CO	HC	SO_x	TSP
2.9	1.1	0.2	0.004	NA

*Ventura County (California) City Pollution Control District.
**Energy Resources Group.

Source: Energy Resources Group (ERG), 1981.
ERCO, 1977.
U.S. Environmental Protection Agency, 1978b.
Ventura County (California) Air Pollution Control District (VCAPCD), 1981.

Table IV-35

Typical Emission for Exploratory Drilling Activity[1]
in the Gulf of Mexico
(tons)

NO_x	CO	SO_x	VOC	TSP
10.3	1.51	0.69	0.34	Unknown

[1] Assumes: 10,000' hole; 597,120 hp/hr used; a 30 day period.

Source: U.S. Environmental Protection Agency, 1977.

Table IV-36

Typical Emissions for a Major Platform
in the Gulf of Mexico
(tons/year)

Equipment[1]	NO_x	CO	SO_x	VOC	TSP
3400 HP Turbine Generator	43	16	0.1	3.0	0.1
One Million BTU Heat Treater	2	0.2	0.1	0.1	0.1
600 HP Recip. Oil Pump	63	8.0	25	0.1	0.1
Total	108	24.2	25.2	3.2	0.3

[1] Assumed to be the most commonly used equipment based on current records compiled since June 1980 to the present.

Source: USDI, Minerals Management Service, Gulf of Mexico OCS Region.

Table IV-37

Air Emissions for Peak Years
Central Planning Area
(tons/year)

	NO_x	CO	SO_x	VOC	TSP	Wells and Major Platforms[1]
Proposed Action - M Scenario						
Exploratory Drilling	824.0	45.3	55.2	27.2	-	80
Production Drilling	309.0	45.3	20.7	10.2	-	30
Platforms	3,000.0	584.0	8.0	902.0	6.0	20[2]
Total	4,133.0	674.6	83.9	939.4	6.0	
Resources Expected to be Developed						
Exploratory Drilling	4,223.0	619.1	289.9	139.4	-	410
Production Drilling	3,090.0	453.0	207.0	102.0	-	300
Platforms	1,750.0	1,314.0	18.0	2,029.5	13.5	45[3]
Total	9,063.0	2,386.1	514.9	2,270.9	13.5	
Existing Platforms	210,000.0	40,880.0	560.0	63,140.0	420.0	1,400[3]
Cumulative Total	223,196.0	43,940.7	1,158.8	66,350.3	439.5	

[1] A major platform is one that has equipment capable of producing emissions.
[2] Assumes all platforms will be major.
[3] Assumes 50% of all platforms will be major.

emissions. Trends in the number of platforms for the future show a slow decline in the Gulf; therefore, the current number of major platforms is assumed to be the peak year.

A total of estimated emissions resulting from the proposed action and resources expected to be developed from prior sales and existing activities is provided in Table IV-37. The volume estimated assumes all activity occurs in the same peak year. Since it is most unlikely that peak years will be coterminous, the estimate is assumed to be high.

It should be noted that the emissions estimated in Table IV-37 are not based on a detailed inventory of emissions. Such an inventory is being developed and when completed will provide a more accurate result. It should also be noted that the cumulative effect of estimated emissions is not presently known. Air quality modeling of offshore conditions will provide information on cumulative effects. This modeling effort is underway.

Specific information on changes in ambient air quality onshore cannot be attained with available information; however, a qualitative assessment of onshore effects can be made. The specific location and intensity of offshore activity in an area will ultimately play a large role in determining onshore impacts; these factors are unknown at present. Controls or offsets are not expected to be necessary for offshore facilities.

Alternative A is expected to create evenly distributed activity throughout the Central Gulf with the exception of subplanning area C-4. Subplanning area C-4, where a minimum of activity is expected, is adjacent to coastal subarea C-4 which includes Hancock, Harrison, and Jackson Counties, Mississippi and Mobile and Baldwin Counties, Alabama.

The remainder of coastal counties throughout the Central Gulf will be adjacent to evenly distributed offshore activities in subplanning areas C-1, C-2, and C-3. In each of these areas, the activity ranges from 98-154 exploration and delineation wells, 50-91 development/production wells, and 5-9 platforms.

Of these coastal parishes/counties adjacent to the majority of annual offshore development, the ones most likely to be adversely impacted by this activity due to their unique status as nonattainment or having PSD Class I areas are: St. John the Baptist, Orleans, Jefferson, St. Bernard, St. Charles, Lafourche, St. Mary, and Plaquemines Parishes, Louisiana.

Of all the parishes/counties identified above as nonattainment or PSD and adjacent to expected activity, the most likely area to be impacted would be St. Bernard/Plaquemines Parishes, Louisiana where the PSD Class I-Breton Wilderness Area is located offshore.

The expected levels of activities adjacent to the above parishes/counties is not large. These activities are not expected to occur simultaneously and are not expected to cause impacts above the level defined as low. Low impacts can be based solely on the amount of activity expected to occur.

Additionally, no significant deterioration of onshore air quality is expected from routine offshore operational emissions due to the regulatory control provided in 30 CFR 250.57. These regulations limit emissions from OCS facilities relative to significance levels outlined in Tables IV-39 and IV-40 of the Final Regional EIS. These regulations insure that impacts do not rise above an upper level (moderate) and will be considered nonsignificant. Impacts are controlled by regulations in this case such that public health and welfare are protected at an acceptable level. Impacts from uncontrolled (nonroutine) events could be much higher. The expected duration of impacts and a summary of expected impacts on the resource of concern are presented in Table IV-38.

Conclusion

Moderate impacts are expected in St. Bernard, Plaquemines, St. Mary, Lafourche, St. Charles, Jefferson, Orleans, and St. John the Baptist Parishes in Louisiana and Mobile County in Alabama. Very low impacts are expected throughout the remainder of the coastal area of the Central Gulf and in Escambia County in the Eastern Gulf.

Table IV-38

Summary of Expected Impacts on Air Quality-Proposed Action
Central Planning Area

Major Impact Producing Factor	Expected Impacts Onshore	Duration of Expected Impacts (if applicable)
Offshore Activity		
Catastrophic Events		
Blowouts with fire	Low to moderate	Short-term (less than 1 year)
Oil spills (major)	Low to Moderate	Short-term (less than 1 year)
Release of sour gas (nonflared blowout)	Moderate to High	Short-term (less than 1 year)
Operational Emissions		
Exploration Drilling	Low to moderate*	Long-term (more than 3 years)
Platform installation	Low to moderate*	Long-term (more than 3 years)
Development drilling	Low to moderate*	Long-term (more than 3 years)
Oil production	Low to moderate*	Long-term (more than 3 years)
Gas production	Low to moderate*	Long-term (more than 3 years)
Barge loading	Low	Long-term (more than 3 years)
Onshore Activity		
Operational Emissions		
Refineries	No new expected*	Long-term (more than 3 years)
Gas processing plants	No new expected*	Long-term (more than 3 years)

*Impacts from these activities are maintained below an upper limit (moderate) due to standing regulatory controls.

Note: Specific changes in conditions relative to levels of impacts are defined at the beginning of this section.

Cumulative Impacts

Currently, there are estimated to be 85 gas processing plants and 31 refineries operating in the CCA with the vast majority located in Louisiana. In addition to existing gas processing plants, it is estimated that 0-3 new plants may be used as a result of Federal OCS activity; however, no new oil refineries are estimated to be used. It is assumed that new source performance standards and best available control technology will be used on all onshore facilities. It is assumed that additional controls or offsets may be required in some areas to meet air quality standards imposed by existing regulations. It can be assumed that impacts will be their highest (relatively) in the following parishes/counties which are classified as nonattainment or PSD Class I areas: St. John the Baptist, Orleans, Jefferson, St. Bernard, St. Charles, Lafourche, St. Mary, and Plaquemines Parishes, Louisiana; and Mobile County, Alabama.

It must be noted that these areas identified are nonattainment areas for a specific pollutant (O_x and TSP). Gas processing produces specific SO_x emissions only. Therefore, these activities will not be a significant contribution to the identified parishes/counties, except that these activities may use a substantial increment of the allowable SO_x limit.

Offshore infrastructure in the CPA is estimated to be 2,800 platforms and 16,124 exploration and production wells as a result of historic leasing activity through 1983. Emissions for OCS installations is calculated at the time of permitting production facilities. Such factors as the distance to shore, climatological conditions, and emissions producing equipment on each platform is analyzed as to its contribution to degradation of air quality. Since records have been kept (June 1980), this air quality permitting analysis has identified a negligible contribution in the CPA.

Point source emissions from onshore activities, such as non-OCS oil and gas processing, power generation facilities, industrial processing or manufacturing facilities, waste incineration facilities, petrochemical storage facilities and mobile emissions sources (automobiles, waterborne transportation, etc.), are expected to increase at rates in proportion to the growth of population. Energy conservation, improved automobile emission controls, alternative (non-fossil fuels) energy generation facilities, and new waste disposal technology are factors that will determine the rate of change in air quality. Due to population in-migration throughout the Gulf region, the ambient air quality will probably degrade, over time, due to the overall effects of these activities and OCS-related activities. Ambient air quality is not expected to degrade beyond attainment standards where it is currently better than those standards or where PSD areas are located. The effects of all emissions on areas presently classified as nonattainment will be reduced over time so that attainment standards will be met. Controls and offsets may be applied to emissions sources to meet these standards.

Conclusion

The overall cumulative impacts will be moderate.

(5) Impacts on Endangered and Threatened Species

The definitions of impact levels for endangered and threatened species are as follows:

Very High	- A species or regional population declines in abundance (greater than 5%) or distribution, and recruitment would not replace lost individuals for at least one generation.*
High	- A species or regional population temporarily declines in abundance (less than or equal to 5%) or distribution, or its recruitment is affected. Recovery would require at least two breeding cycles** but less than one generation.

Moderate - A species or regional population temporarily declines in abundance (less than or equal to 1%). Its distribution is minimally altered or its recruitment is marginally affected. Recovery occurs in one breeding cycle.

Low - A limited portion of a species' regional population experiences sublethal effects, resulting in changes in distribution which last for less than one year.

Very Low - A limited portion of a species population experiences sublethal effects. Changes in distribution slight but enough to initiate the consultation process.

*A generation is the term of years accepted as the average period between the birth of the parents and the birth of their offspring.

**A breeding cycle is the average period of time between the births of successive offspring.

An endangered species consultation pertaining to proposed Gulf of Mexico oil/gas lease sales was held with FWS and NMFS. The biological opinions from these agencies (Appendix C) indicate that leasing and exploration activities associated with the proposed action are not likely to jeopardize the continued existence of the listed species considered in the consultations or result in the destruction or adverse modification of their critical habitats.

Of the endangered and threatened species discussed in Section III.B.3., sea turtles and brown pelicans are probably the species more vulnerable to OCS-related oil/gas impacts resulting from the proposed action. The five endangered whale species (finback, humpback, right, sei, and sperm) are not likely to be impacted by OCS oil and gas activities because they are only occasionally sighted in areas where OCS oil/gas activities occur, they are few in number (Fritts et al., 1983), and no adverse impacts to whales have been reported or documented from OCS oil/gas activities in this area.

(a) Impacts on Sea Turtles

Impact Analysis

Loggerhead, green, leatherback, Kemp's ridley, and hawksbill turtles occur in the proposed sale area. Occasional loggerhead nesting has occurred on Horn and Ship Islands off Mississippi and the Chandeleur Islands off Louisiana. No green, leatherback, ridley, or hawksbill turtle nesting has been reported in the CPA. Leatherback, loggerhead, and Kemp's ridley turtles forage off the Louisiana coast.

The major impact producing factors which could potentially affect sea turtles in the CPA include OCS-related oil spills, collision with OCS-related support vessels, and OCS-related pipeline construction across nesting beaches. Oil spills contacting a turtle nesting beach during egg incubation or hatching periods (July-August) could cause significant turtle mortality (Fritts and McGhee, 1981). Offshore oil spills could have a serious impact on sea turtles, especially juvenile turtles. Floating oil could result in mortality of turtles by contacting the turtles when they surface to breathe and indirectly by affecting food sources.

One large oil spill contact (1,000 bbls or greater) with a sea turtle habitat is assumed for analysis purposes based on the OSRA. A number of smaller oil spill contacts are also assumed. The level of expected impact resulting from such spill contacts is estimated to be low, that is, significant short-term effects involving some mortality of a local population. It is noted that the probability of a large oil spill contact with sea turtle habitats is very low (10%).

Vessel traffic related to the proposed action poses a collision threat which could cause serious injury or mortality to sea turtles. Information on the number of OCS-related boat collisions in this area is unavailable; however, no adverse effects of vessel traffic on sea turtles has been reported or documented. Considering the estimated level of vessel traffic generated by the proposed action that would pass through turtle habitats in relation to the estimated numbers and temporal variability of sea turtles in these areas, the level of expected impact is estimated to be low, that is, some mortality of the local sea turtle population could occur.

No projected pipeline construction that would impact sea turtle nesting beaches is expected for the CPA as a result of the proposed action.

Conclusion

A very low level of impact on sea turtles and their habitat is expected in the Central Gulf area as a result of the proposed action.

Cumulative Impacts

In addition to the impacts discussed previously for the proposed action, impacts from existing Federal OCS oil/gas leases and activities; existing oil/gas leases and activities in State tidelands; tankering of petroleum products and foreign crude oil; and other commercial, military, and recreational offshore and coastal activities should be considered as cumulative impacts.

The cumulative number of assumed large oil spill contacts (1,000 bbls or greater) with sea turtle habitats is three. In addition, a large oil spill contact could occur as a result of oil development in Louisiana tidelands, and a number of smaller oil spill contacts are assumed with sea turtle habitats. The highest probability (76%) of a large oil spill contact is in Plaquemines Parish, Louisiana, where two oil spill contacts are assumed. The area between Marsh Island and the Mississippi Delta is a feeding area for loggerhead and ridley turtles. These oil spill contacts are estimated to result in some sea turtle mortality in this area. The expected cumulative impact of oil spill contacts on sea turtles is estimated to be moderate.

Impacts that are unrelated to oil/gas activities but contribute to a cumulative impact on sea turtles include: the loss of nesting beaches to commercial, recreational, and residential development along Louisiana beaches; moderate to high mortality caused by commercial trawling; natural and man-induced predation of turtles and eggs on nesting beaches throughout the Gulf of Mexico and Caribbean Sea regions; oil/tar balls from natural seeps, bilge cleaning, and tanker spills; compaction, subsidence, and flooding of nesting beaches; incidental capture by commercial longline fishing gear and entanglement in crab pot lines; dumping of contaminated wastes and plastic materials into the sea; and collision with commercial, military, and recreational vessels. In 1983, about 375 turtle strandings were reported for the Gulf of Mexico and 6 have been reported in the CPA through August 1984 (1 loggerhead and 5 ridley turtles) (USDC, NMFS, 1984b). The cumulative effect of these activities is expected to result in a high level of impact on sea turtles in the CPA.

Conclusion

As a result of the proposed action and other activities, the overall cumulative impact on sea turtles in the Central Gulf is estimated to be high.

(b) Brown Pelicans

Impact Analysis

There are four nesting sites of brown pelicans along the Central Gulf coast. One site is located in the vicinity of North Island, Louisiana, with about 1,000 birds, a small site is located just south of the mouth of the Pearl River, a site is located in the vicinity of Queen

Bess Island, Louisiana, with about 1,000 birds, and a site is located on Gaillard Island (near Theodore) in Mobile Bay, Alabama.

The major impact producing factors which could potentially affect brown pelicans in the CPA include OCS-related oil spills, disturbance from aircraft and vessel traffic, and coastal facility construction.

Brown pelicans may be vulnerable to oil spills because as they plunge-dive for fish, their feathers could be coated with oil. This may contribute to direct mortality or could result in a secondary impact of reduced hatchability of eggs that become oiled by contaminated adult birds.

One large (1,000 bbls or greater) and several smaller oil spill contacts are assumed with pelican habitats, with a 10% probability of occurrence. These spill contacts are expected to cause a very low level of impact.

The estimated aircraft and boat traffic in the vicinity of pelican nesting areas and the estimated onshore facility construction are expected to have a very low level of impact on brown pelican nesting areas.

Conclusion

A very low level of impact on brown pelicans and their feeding and nesting habitat is expected in the Central Gulf as a result of the proposed action.

Cumulative Impacts

In addition to the impacts discussed previously for the proposed action, the effects of existing Federal OCS oil/gas leases and activities; existing oil/gas leases and activities in State tidelands; tankering crude oil; and other commercial, military, and recreational offshore and coastal activities are considered in the cumulative impact analysis.

The expected Gulfwide cumulative number of oil spills from the proposed action, existing OCS leases, and imports is two spills greater than 1,000 bbls and several smaller spills with a very high probability (98%) of occurring and contacting brown pelican habitat. Plaquemines Parish, Louisiana, is the area with the highest probability of contact due to the extensive OCS and State oil development in the Mississippi Delta area and the tankering of crude oil and products on the Mississippi River. Also, there are high levels of oil and organic chemical contamination in the river water and sediments. There are three brown pelican rookery areas within this general area. The cumulative impact of oil spill contacts and probable water and food contamination is expected to result in a moderate level of impact on brown pelicans in the CPA.

Disturbance from aircraft, boat, and vessel traffic in the vicinity of pelican nesting areas in the CPA is not likely to increase above current levels as a result of OCS oil/gas activities. About 90% of the boat and ship traffic in this area is non-OCS-related traffic such as: commercial tanker/cargo vessels; commercial and recreational fishermen; intracoastal tug and barge traffic; and maintenance dredging operations.

Impacts from OCS-related oil/gas onshore development and support facilities are not expected to increase much above current levels to handle cumulative OCS oil/gas resources. A few additional pipelines and processing facilities may be required; but the majority of the OCS-related onshore facilities are already established. Other commercial and recreational construction and dredging in the coastal wetland areas could result in changing hydrology and habitat alteration, which could impact brown pelican habitat or food sources.

Impacts that are unrelated to OCS activities but contribute to the major cumulative impact on brown pelicans would include the loss of habitat to commercial, military, recreational, and residential development in the coastal zone; dredging and draining of wetland and coastal feeding areas; high levels of oil and organic chemical contamination of coastal water and food sources of agricultural runoff and industrial wastes; the disturbance from aircraft, boat, and vessel traffic in nesting and feeding areas; entanglement in commercial and recreational fishing gear; and flooding of nesting areas.

Conclusion

As a result of the proposed action and other activities, the overall cumulative impact on brown pelicans is estimated to be moderate.

(6) Impacts on Marine Mammals

The definitions of impact levels for marine mammals are as follows:

Very High	- A species or regional population declines in abundance or distribution, and recruitment would not replace lost individuals for two generations.*
High	- A species or regional population declines in abundance or distribution, and recruitment would not replace lost individuals for one generation.*
Moderate	- A species or regional population temporarily declines in abundance or distribution, or its recruitment is affected. Recovery would require more than one, but less than two breeding cycles.**
Low	- A species or regional population temporarily declines in abundance; its distribution is altered minimally; or its recruitment is marginally affected. Recovery would require less than one breeding cycle.**
Very Low	- A limited portion of a species or regional population experiences sublethal effects that may result in changes in distribution which lasts for less than one year.

*A generation is the term of years accepted as the average period between the birth of the parents and the birth of their offspring.

**A breeding cycle is the average period of time between the births of successive offspring.

Impact Analysis

Of the marine mammals discussed in Section III.B.4., the bottlenose dolphin is probably the non-endangered marine mammal most likely to be affected by OCS-related oil/gas activities based on their population and nearshore habitat (Fritts and Reynolds, 1981; Schmidly, 1981). Potential impacts on whales are discussed in Section IV.D.1.a.(5).

The major impact producing agents which could potentially affect marine mammals include OCS-related oil spills, collision with OCS-related support boats, and disturbance from OCS-related oil/gas activities.

Some members of localized populations or sub-populations of bottlenose dolphins could be affected by oil spills in bays or harbor areas. Dolphins have been observed swimming and feeding in oil slicks, and oil apparently does not adhere to their smooth skin (Geraci and St. Aubin, 1982). It is unlikely that dolphins would inhale oil into their blowhole while breathing. Some hydrocarbon contaminated food or water could be ingested; however, the effects of hydrocarbon ingestion by marine mammals is unknown.

One large oil spill contact (1,000 bbls or greater) is assumed with marine mammal habitats. In addition, a number of smaller oil spill contacts are assumed to occur. These spill contacts with marine mammal habitats, to the extent that they come into physical contact with marine mammals and oil is ingested, could cause adverse effects including mortality in some cases. It is noted that the chance of potential impact producing events is very low.

As a result of the proposed action, vessel traffic in the Central Gulf is estimated to increase less than 4%. The level of OCS-related vessel collisions with marine mammals in the Central Gulf is unknown; no injuries or mortalities have been reported. The level of impact to marine mammals resulting from OCS-related vessel collisions is expected to be very low.

About 560 wells may be drilled, and additional seismic exploration may be required over the 18- to 20-year period of the proposed action. Well drilling and seismic activities apparently do not pose a significant impact to marine mammals (Gales, 1982 and USDI, MMS, 1983f). No adverse impacts resulting from these activities have been reported or documented in the Gulf of Mexico region. The disturbance is usually short-term and fairly localized near the source, and it is unlikely to cause a major impact on marine mammals in the Central Gulf (NMFS Biological Opinion, Appendix C).

Conclusion

It is estimated that OCS-related oil spills, collision with offshore support vessels, and disturbance from OCS oil/gas activities will have a very low level of expected impact on marine mammals and their habitat.

Cumulative Impacts

In addition to the impacts discussed previously for the proposed action, impacts from existing Federal OCS oil/gas leases and activities; existing oil/gas leases and activities in State tidelands; tankering of petroleum products and foreign crude oil; and other commercial, military, and recreational offshore and coastal activities should be considered as cumulative impacts.

Cumulative impacts to marine mammals from OCS-related oil/gas activities in the CPA could result from cumulative Gulfwide oil spills. Seven oil spills greater than 1,000 bbls and several smaller spills are assumed. An unknown number of spills could occur in Louisiana tidelands and from the Louisiana offshore port facility. These spills could have adverse effects on marine mammals in the CPA. Deepwater exploration and development on the continental slope could effect sperm whales which feed on squid in deepwater areas. Oil spills are expected to have a low level of cumulative impact on marine mammals in the CPA.

The OCS-related aircraft, boat, and vessel traffic estimated for the proposed action is less than 4% of the existing and projected commercial military and recreational vessel traffic in the offshore areas inhabited by marine mammals. About 268,340 vessel trips of all types were recorded for the CPA in 1982. Seismic exploration will occur on additional lease blocks, and sound will be generated from offshore platforms and supply/crew boats and aircraft. Additional sound is produced by commercial, military, and recreational vessels and aircraft and by commercial and military sonar. The majority of these disturbances and noises are usually localized around the source and are fairly short-term. Other cumulative impacts from disturbances and noises in the Caribbean Sea and Atlantic Ocean are uncertain. The cumulative impact from these disturbances and noises are expected to be low in the CPA.

Impacts that are unrelated to OCS activities but could contribute to a cumulative impact on marine mammals include: commercial and subsistence hunting of whales; entrapment, injury, and mortality in fishing gear and underwater cables; and ocean disposal of chemicals, radioactive wastes, munitions, etc., into deepwater areas.

Conclusion

As a result of the proposed action and other activities, the overall cumulative level of expected impact on marine mammals in the Central Gulf is estimated to be low.

(7) Impacts on Coastal and Marine Birds

The definitions of impact levels for coastal and marine birds are as follows:

Very High - A species or regional population declines in abundance or distribution, or its recruitment is affected. Recovery would require more than two generations*.

High - A species or regional population declines in abundance or distribution, or its recruitment is affected. Recovery would require at least two generations*.

Moderate - A species or regional population temporarily declines in abundance or distribution, or its recruitment is affected. Recovery would require more than one, but less than two generations.*

Low - A species or regional population temporarily declines in abundance; its distribution is altered minimally; or its recruitment is affected. Recovery would require less than one generation*

Very Low - A limited portion of a species or regional population experiences sublethal effects that may result in changes in distribution which lasts for less than one year.

*A generation is the term of years accepted as the average period between the birth of the parents and the birth of their offspring.

Impact Analysis

The major impact producing agents which could potentially affect coastal and marine birds as a result of the proposed action include: OCS-related oil spills, disturbance from onshore facility construction near coastal nesting areas, and displacement of birds from feeding and nesting areas due to increased aircraft, boat, and vessel traffic.

Many of the coastal and marine bird species in the CPA, which are susceptible to oil spills, are migratory and could be exposed to oil spills during their over-wintering period (October-March). Oiling of birds causes death from hypothermia, shock, or drowning; oil ingestion significantly reduces reproduction in some birds; and oil contamination of eggs by oil-fouled adult birds reduces hatchability. Indirect effects of oil pollution on birds include contamination, displacement, and reduction of food sources. Long-term contamination of food sources and habitats may cause chronic toxicity to birds through the accumulation of hydrocarbon residues and may affect their behavior, physiology, and reproduction.

A recent (February 16, 1985) pipeline leak about 25 miles southeast of the Chandeleur Islands, Louisiana, resulted in the spillage of about 410 bbls of Louisiana crude oil. About 162 bbls of the oil was recovered. The spill resulted in the death of about 14 birds (ducks, gannets, gulls, and loons). The spill site was about 40 miles southeast of the brown pelican rookery on North Island. None of the pelicans or their habitat was affected.

One large spill (1,000 bbls or greater) and several smaller spill contacts with land are assumed. These spill contacts could affect coastal and marine birds that migrate through these areas.

Disturbance of coastal and marine bird nesting and feeding habitat from onshore construction and associated noise from aircraft, boat, and vessel traffic could result in a reduction or elimination of birds that use the habitat for feeding and nesting. Dredging and the construction of pipelines and roads could change hydrology that may result in complete conversion of a marsh ecosystem (Section IV.D.1.a.(1)).

It is estimated that one new service base requiring up to 75 acres could be established in Harrison or Jackson Counties, Mississippi, or Mobile County, Alabama, that may affect coastal and marine bird habitat in these areas (Section IV.A.1.e.). Since this projected onshore construction will probably be located in developed port areas, it is unlikely that it will impact coastal and marine bird habitat.

Conclusion

In the Central Gulf, the proposed action is estimated to have a low level of impact on coastal and marine birds from OCS-related oil spills, disturbance from onshore construction, and other OCS-related oil/gas activities.

Cumulative Impacts

In addition to the impacts discussed previously for the proposed action, impacts from existing Federal OCS oil/gas leases and activities; existing oil/gas leases and activities in State tidelands; tankering of petroleum products and foreign crude oil; and other commercial, military, and recreational offshore and coastal activities should be considered as cumulative impacts.

In the CPA the assumed cumulative number of oil spill contacts resulting from the proposed action, existing OCS leases, and imports is seven. A number of smaller contacts is also assumed. Plaquemines Parish, Louisiana, is the area with the highest probability of contact due to the extensive oil development in the Mississippi Delta area and the tankering of crude oil and products on the Mississippi River. An unknown number of spills could occur from oil production in Louisiana tidelands. Coastal and marine birds that migrate through more than one OCS planning area may be exposed to oil spills in other areas. The cumulative impact on coastal and marine birds from oil spills in the CPA is expected to be moderate.

Disturbance from aircraft, boat, and vessel traffic in the vicinity of bird nesting and feeding areas in the CPA is not likely to increase above current levels as a result of OCS-related oil/gas activities. About 90% of the aircraft, boat, and vessel traffic in the CPA is non-OCS-related.

Cumulative impacts from OCS-related onshore development and support facilities are not expected to increase much above current levels, as most of the OCS-related facilities are already established. A few additional pipelines and processing plants may be required.

Impacts that are not related to OCS activities but could contribute to a cumulative impact to coastal and marine birds would include the loss of habitat to commercial, military, recreational, and residential construction. Dredging and draining of wetland areas along migratory flyways and in coastal feeding and overwintering areas causes additional habitat loss. Entanglement in commercial and recreational fishing gear and flooding of nesting areas result in coastal and marine bird loss. High levels of oil and organic chemical contamination in the river runoff into the northern Gulf of Mexico could cause direct mortality or cause indirect food loss to avian species.

Conclusion

As a result of the proposed action and other activities, the overall cumulative impact on coastal and marine birds in the Central Gulf is estimated to be moderate.

(8) Impacts on the Commercial Fishing Industry

The major impact producing factors on fishing activities from the proposed action would be production platforms and gear conflicts. Production platforms remove from 3-5 acres of trawling space, and gear conflicts result in such losses as trawls, shrimp catch, business downtime, and vessel damage. The financial losses from gear conflicts are theoretically covered by the Fishermen's Contingency Fund. All of the 230 claims (averaging about $4,000) submitted for payment for damages on the OCS Gulfwide before November 1, 1982, when the new regulations were published, have been settled. In 1983, 117 claims (averaging about $3,300) were filed and processed with 73% being approved. By February 29, 1984, 57 claims (averaging between $3,500-$4,000) had already been received for processing, representing a monthly increase in the number of submitted claims. The average claim processing time has been reduced from as much as seven months to about 40 days after NMFS receives the completed claim. Although this fund is effective, fishermen filing claims, as well as those that do not bother to do this, are absorbing some economic loss from this impact producing factor.

Oil spills that contact the coastal marshes, bays, and estuaries have the greatest potential for damage to commercial fishery resources. The majority of the Gulf's fishes are estuarine dependent. Potentially, oil spills could seriously impact fishery resources such as shrimp and many species of finfish that use these areas as nursery and/or spawning grounds, as well as sessile organisms such as oysters. Although adult finfish are usually able to avoid an offshore oil spill, large numbers of floating eggs, larvae, and juveniles could be destroyed.

According to Evans and Rice (1974), the impacts on fishery resources from oil pollution are: (a) killing organisms through coating and asphyxiation; (b) killing organisms through contact poisoning; (c) killing organisms through exposure to the water soluble toxic components of oil at some distance in time and space from the accident; (d) destroying the generally more sensitive juvenile organisms; (e) destroying sources of food and shelter; (f) incorporating sublethal amounts of oil and oil products into organisms (resulting in reduced resistance to infection and other stresses); (g) incorporating carcinogenic and potentially mutagenic chemicals into marine organisms; and (h) introducing low-level effects that may interrupt any of numerous behavioral stimuli (such as prey location, predator avoidance, mate location, other sexual stimuli, and homing behavior) necessary for the propagation of marine species and for the survival of those species higher in the marine food web.

Soluble aromatic hydrocarbons can be lethal to adult fishes in low concentrations (1-100 ppm) and to the more sensitive larval stages at even lower concentrations (0.1-1 ppm). Crustaceans appear to be the most sensitive (1-10 ppm) while fish and bivalves are moderately sensitive (10-100 ppm); however, lethal concentrations may be lower (0.1-1 ppm) for the more sensitive larval and juvenile forms. Studies cited by Evans and Rice (1974) show that certain fish eggs are extremely sensitive to the influence of oil products. For example, fertilized eggs of the plaice (Rhombus macoticus) were injured at concentrations of 0.01-0.1 ppm with 40%-100% of the hatched prelarvae showing some signs of degeneration during development and perishing (Nounou, 1980).

The damage from an oil spill will depend on a number of factors, including: (a) the amount of oil spilled; (b) how much weathering the oil experiences before contacting fish, larvae, or eggs; (c) the depth at which the various life stages are found, since the concentration and composition of oil falls off rapidly with depth; (d) how large an area will be impacted; and (e) the toxicity of the oil.

Environmental factors contribute to the toxicity of oil in nearshore environments. The shallow waters of the estuaries allow temperatures to soar upward during four to five months of the year. The organic-rich sediments also reach high temperatures, and strong northerly winds cause extremely low tides. Heavy rainfall results in flooding and rapid changes in salinity. Although these extreme environmental conditions accelerate the degradation of crude oils, they are also the primary factors encountered by estuarine organisms. The net effect is not only a rapid weathering of oil but also an intensification of its toxic effects (Lytle, 1975).

Although oil is toxic to finfish and shellfish, studies by Restrepo and Associates (1982) on the Ixtoc spills in the Gulf of Mexico found that "There is no significant direct economic effect of the oil spills on the commercial fishing industry of Texas measurable at the regional or major subregional levels. Additionally, there are no measurable indirect economic effects that stem from the impact on the commercial fishery sector." The analysis for this conclusion depended on both primary and secondary data. Secondary data included landings, effort, and value. Primary data were collected by telephone or in person and was an extensive survey of fishermen, dockside dealers, biologists, marine advisory agents, and local businessmen. The Ixtoc spills resulted in the spillage of 140 million gallons (3.5 million bbls) and the transport of a significant part of this from Mexican waters northward into coastal waters of the United States. It should be pointed out, however, that virtually no oil from these spills reached Texas' bays and estuaries.

Commercial fishery resources could also be adversely affected by the discharge of drilling muds. Drilling muds contain materials toxic to marine fishes; however, only at concentrations four or five orders of magnitude higher than those found more than a few meters from the discharge point. Further, dilution is extremely rapid in offshore waters to the extent that every substance measured in the water column is at background at a distance of 2,000 m (probably within 1,000 m) of the discharge point (Ecomar, Inc., 1980). The emplacement/construction of pipelines, pipeline canals, navigation channels, and landside support facilities may contribute to changes in salinity regimes, water current patterns, turbidity, and/or wetland/seagrass loss which in turn will have a negative impact on fishery resources.

The following assumptions were used in the analysis of major impacts on the commercial fishing industry:

- The loss of fishing area from platform/structure construction will result in a very low impact if the number of acres lost represents less than 0.1% of the total trawling area.

- It is not possible to determine the number of platforms that will be constructed in State waters; consequently, this factor is not included in the cumulative impact analysis.

- Bays refer to nearshore, open-water bays and sounds and provide finfish and shellfish nursery and/or spawning grounds.

- Open bays are considered "exposed"; that is, spilled oil from OCS activities cannot be deflected or diverted before reaching fishery resources in these areas.

- Enclosed bays are considered "unexposed"; that is, spilled oil from OCS activities can be deflected or diverted before reaching fishery resources in these areas.

- An oil spill greater than 1,000 bbls that contacts the open bays within 10 days of the spill could have severe, medium-term (1-3 years in duration) consequences on invertebrate and vertebrate fisheries and deter fishing in these areas, resulting in a high impact.

- An offshore oil spill greater than 1,000 bbls that does not contact the bays could destroy some fish eggs, larvae, and juveniles and could disrupt fishing (such as reef fishing and shrimping) if the spill occurs in close proximity to the localized fishing area. The duration of the impact will be short-term (less than one year in duration), resulting in a moderate impact.

- Fishermen will absorb some economic loss through gear conflicts since some of them will not bother to file a claim against the Fishermen's Contingency Fund, and others will be unable to establish that damage or loss was associated with energy-related activities.

- Oil spills of less than 1,000 bbls that originate on the OCS and contact State waters could result in localized short-term effects on fisheries resources with recovery probably taking place within one year, resulting in a low impact. (Cumulatively over the long-term, these spills may impact these resources; however, there is presently no evidence that small spills have had any more than minimal cumulative impacts on fisheries resources over the long history of oil and gas development and production in the Gulf.)

In addition, the following criteria for five levels of impact were developed for use in the analysis and conclusions:

Very High - An economic loss of greater than 5% to the commercial fishing industry, many fishermen out of work, and secondary employment (processing plants, etc.) substantially affected.

High - A 1%-5% economic loss to the commercial fishing industry, some fishermen out of work, and secondary employment affected.

Moderate - A 0.1%-1% economic loss to the commercial fishing industry, some financial loss to fishermen, and secondary employment affected.

Low - A 0.01%-0.1% economic loss to the commercial fishing industry, some fishermen affected, but no effect on secondary employment.

Very Low - A 0.01% or less economic loss to the commercial fishing industry, and a few fishermen affected.

Impact Analysis

From 1977-1981 approximately 1.5 billion lbs/yr of finfish and shellfish with a dockside value of $281.1 million were caught in the Central Analysis Area (Table IV-39).

Analysis Area C-1 provides commercial fisheries catch totaling approximately 568 million lbs/yr valued at $77.7 million. These figures represent about 38% and 28%, respectively, of the commercial fisheries catch and value for the Central Analysis Area. The inshore portion of this analysis area provides about 6.9 million lbs/yr of commercial fisheries catch worth $3.6 million. Five offshore platforms/structures are expected to result from the proposed action, eliminating less than 0.1% (15-25 acres) of trawling area. There are about 189,000 acres of open bays in this area which could be affected by an oil spill contact(s), as discussed below.

Analysis Area C-2 provides commercial fisheries catch totaling approximately 378.1 million lbs/yr, valued at $95.5 million. These figures represent about 25% and 34%, respectively, of the commercial fisheries catch and value for the Central Analysis Area. The inshore portion of this analysis area provides about 28.4 million lbs/yr of commercial fisheries catch worth $21.6 million. Nine offshore platforms/structures are expected to result from the proposed action, eliminating less than 0.1% (27-45 acres) of the trawling area. Open bays constitute about 542,000 acres in this area which could be affected by an oil spill contact(s), as discussed below.

Analysis Area C-3 contributes approximately 422.3 million lbs/yr of commercial fisheries catch valued at $85.8 million. These figures represent about 18% and 31%, respectively, of the commercial fisheries catch and value for the Central Analysis Area. The inshore portion of this analysis area provides about 271 million lbs/yr of commercial fisheries catch worth $38.6 million. Five offshore platforms/structures are expected to result from the proposed action, eliminating less than 0.1% (15-25 acres) of the trawling area. Open bays and sounds constitute over 1.5 million acres in this area which could be affected by an oil spill contact(s), as discussed below.

Analysis Area C-4 contributes approximately 117.9 million lbs/yr of commercial fisheries catch valued at $22.1 million. These figures represent about 8% of the commercial fisheries catch and value for the Central Analysis Area. The inshore portion of this analysis area provides about 10.5 million lbs/yr of commercial fisheries catch worth $11.5 million. One platform/structure is expected to result from the proposed action, eliminating less than 0.1% (3-5 acres) of the trawling area. Open bays constitute over 7 million acres in this area which could be affected by an oil spill contact(s), as discussed below.

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Table IV-39

Commercial Fisheries Resources and Impact Producing Factors
Central Gulf of Mexico

		Resources				Impact Producing Factors								
						Number of Assumed Large Spill Contacts					Offshore Production Platforms (number)			
Analysis Area*	County/Parish	Annual Landings (million lbs)	Annual Landings (million $)	Open Bay (acres)	Sound (acres)	M Scenario[1]	High Scenario	T Scenario[2]	Cumulative Scenario	Low Scenario	M Scenario	High Scenario	T Scenario	Cumulative Scenario
C-1		568.0	77.7	189,054		1	1	1	1	2	5	10	43	38
	Cameron			-		1	1	1	1					
	Vermilion (Vermilion Bay)			71,048		1	1	1	1					
	Iberia (Vermilion Bay/Atchafalaya Bay)			118,006		1	1	1	1					
C-2		378.1	95.5	542,293		1	1	1	3	3	9	18	170	59
	St. Mary (Atchafalaya Bay/Timbalier Bay)			254,317		0	0	1	1					
	Terrebonne (Atchafalaya Bay/Timbalier Bay)			146,972		1	1	1	1					
	Lafourche (Barataria Bay)			74,192		1	1	1	1					
	Jefferson (Barataria Bay)			66,812		1	1	1	1					
C-3		422.3	85.8	592,702	1,023,464	1	1	1	1	2	5	11	100	55
	OCS			7,180	99,394									
	Plaquemines (Barataria Bay)			238,730	329,028	1	1	1	2					
	St. Bernard (Lake Borgne/ Breton/Chandeleur Sounds)			346,792	595,042	1 (2)	1 (2)	1	1					
	Orleans			-		(2)	(2)	(2)						
	St. Tammany			-		(2)	(2)	(2)						
C-4		117.9	22.1	302,692	440,367	0	0	1	1	1	1	1	7	8
	OCS			-	45,694									
	Hancock			1,340	37,134	0 (3)	0 (3)	1 (3)	1 (3)					
	Harrison (Mississippi Sound)			-	185,458	(3)	(3)	(3)	(3)					
	Jackson			17,555	122,138	(3)	(3)	(3)	(3)					
	Mobile (Mobile Bay)			134,933	49,943			1	1					
	Baldwin (Mobile Bay)			148,864	-			1	1					
Total						1	1	2	6	8	20	40	320	160

(1) Oil spills of 1,000 bbls or greater occurring and contacting indicated targets within 10 days. See Section IV.A.5.
(2) Assumed spill contacts for St. Bernard Parish include those for Orleans and St. Tammany Parishes which are included in the same land segment (20).
(3) Assumed spill contacts for Hancock County include those for Harrison and Jackson Counties which are included in the same land segment (21).

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One large spill (1,000 bbls or greater) and several smaller spill contacts are assumed with open bays containing finfish and shellfish nursery and/or spawning grounds. The large spill contact, which could be with an open bay in either coastal subarea C-1, C-2, C-3, or C-4, could cause severe medium-term (1-3 years) effects on fisheries; the smaller spill contacts could be with the same coastal subareas and could cause localized short-term effects (with recovery likely to occur within one year).

The 20 platforms/structures estimated to result from the proposed action would eliminate less than 0.1% (60-100 acres) of the trawling area in the CAA. Fishermen would absorb some economic loss through gear conflicts. The one assumed large spill contact is based on one assumed spill occurrence. This spill could destroy fish eggs, larvae, and juveniles, and could disrupt commercial fishing in offshore areas contacted by the spill.

Conclusion

The level of expected impact on the commercial fishing industry is estimated to be moderate.

Cumulative Impacts

In addition to the 20 platforms projected for the Central Gulf from the proposed action, another 140 are expected to result from lease sales held in the recent past. The total area lost to trawling (420-700 acres) would still represent less than 0.1% of the total planning area.

Three large spill (1,000 bbls) contacts are assumed with open bays containing finfish and shellfish nursery and/or spawning grounds. Two of these large spill contacts could be with the Barataria Bay, Timbalier Bay, Vermilion/Atchafalaya Bays, or the Lake Borgne areas. These areas are contained in analysis area C-1 for the Vermilion/Atchafalaya Bays, C-2 for the Atchafalaya, Timbalier and Barataria Bays, and C-3 for the Barataria Bay and Lake Borgne areas. These three areas represent 568.0 million lbs/yr worth $77.0 million, 378.1 million lbs/yr worth $95.5 million, and 422.3 million lbs/yr worth $85.8 million dollars, respectively. Also, one of the large spill contacts could be either the Mobile Bay area or with the Galveston Bay area. A spill contacting these areas could result in severe medium-term (1-3 years in duration) consequences on invertebrate and vertebrate fisheries and deter fishing. In addition, a number of smaller spill (less than 1,000 bbls) contacts are assumed with the aforementioned open bays. These spill contacts are expected to result in localized short-term effects on fishing resources.

Commercial fisheries in the Gulf of Mexico are also impacted by activities and events other than the oil and gas industry. Competition between large numbers of commercial fishermen, between commercial operations employing different fishing methods and between commercial and recreational fishermen for a given fishery resource, may reduce standing populations. Fishing techniques which may take significant numbers of other species as by-catch, such as trawling or gill netting, may reduce the standing populations of these as well as the desired species. Within parts of the Central Gulf, no size or count limits are imposed during certain shrimp seasons, causing overfishing in these areas. Also, shrimpers taking large numbers of fishes in the groundfish complex (croakers being an example of this group) may be contributing to reductions in the numbers of these species. Space use conflicts can result from different forms of commercial operations and between commercial and recreational fisheries. In the Central Gulf, for example, crab trapping and shrimping operations often occur in the same area, resulting in loss of fishing area to one or the other or in gear conflicts when both operations attempt to use the same space. Also, the loss of wetlands are being closely studied to determine in what way and to what extent this loss affects commercial fisheries.

Conclusion

The proposed action, prior OCS sales, and other factors added to the widely varying baseline conditions resulting from natural environmental factors, may result in a high level of cumulative impact on the commercial fishing industry.

(9) Impacts on Offshore Marine Recreational Fishing

Volume 1, Section I.B.2. of the Final Regional EIS and subsequent scoping have identified marine recreational fishing as a broad regional concern. The historical record and former OCS sale analyses have shown that the development of platforms on the OCS for oil and gas production has potential for causing a major change in the focus of offshore recreational fishing both locally and regionally. That is not to say that oil spills, pipeline development, onshore support facilities, increased marine traffic, or other impacting factors likely to result from OCS operations will have no effect on recreational fishing. However, none of these impacting factors are likely to affect a major long-term change in the positive or negative aspects of offshore or onshore recreational fishing. Impacts to sports fishing caused by activities and pollution events associated with exploration and development for oil and gas on the OCS will be localized, short-term, and minor when compared to the predictable long-term impacts resulting from the erection of major production platforms. An exception could result from the indirect effect on recreational fishing from a high regional impact affecting biological productivity, i.e., should major adverse consequences from 1986 sales result to the life support systems of primary target, sport fishing species, then recreational fishing would be impacted accordingly. Pollutants such as oil primarily affect the individual organism. If the damage is serious, this may affect the population and in the worst case the whole community. Laboratory experiments recently conducted for the Norwegian Government (1984) have shown that fish can sense oil in water in very low concentrations. This implies that the oil may influence the fish's behavior, for example, to avoid water masses where oil is present. However, neither observations (i.e., at oil installations offshore) nor other experience indicates that oil leads to any significant changes in the behavior of fish in the natural environment. The oil concentrations in seawater (50-100 mg oil/l), which have been shown in the laboratory to induce acute mortality in adult fish, are so high that even in the case of a major oil disaster they will occur only sporadically and to a limited extent. It has been confirmed from experience that adult fish have not died in large numbers after actual accidents (e.g., Ixtoc, Amoco Cadiz, and Alvenus). Even if fish should remain in the water column under an oil spill, fishermen will avoid fishing in an oil slick.

In the event of an oil accident, the fish may be exposed to concentrations of oil in the water which are too low to cause death, but large enough for the oil to accumulate in the fish. Fish are able to transform oil to compounds which can be easily excreted. Therefore, water containing oil will be completely eradicated from the fish in a few weeks after exposure. Fishermen could catch tainted fish in the vicinity of a major spill.

In contrast to adult fish, eggs and larvae are vulnerable to oil concentrations which may occur in connection with a major oil spill. High concentrations of oil have been shown to cause deformations and/or death of exposed eggs and fish larvae. Therefore, a major spill affecting a large nursery area, such as inshore wetlands, could affect a year class of a certain sport species and ultimately have some adverse effect on sport fishing success (Sections IV.D.1.a.(8) and IV.D.2.a.(8)).

Oil and gas structures attract fish and inevitably fishermen. They also provide a convenient and productive fishing resource for many people who work offshore. OCS environmental reports on the artificial reef effects of petroleum platforms conclude that structures concentrate large numbers of epibiota and fishes which would not be as abundantly represented in the same area in the absence of structures (Gallaway et al., 1981). Gallaway and Lewbel (1982) estimated that the 3,500 petroleum structures existing in the Central and Western Gulf provide approximately 4,000 acres of artificial reef habitat on their vertical and horizontal supports. Due to the paucity of hard substrate in the Gulf, the abundance of petroleum structures provides orders of magnitude more opportunity for larval settlement than is naturally available. Gallaway has indicated some fish species may become permanently associated with petroleum structures while others are seasonal transients.

Many of the fish species that congregate around petroleum structures are prime sport fishing targets (snapper, grouper, mackerels, cobia, etc.). The location and availability of desired sport fishing targets can be fairly accurately predicted by selecting platform locations in depth zones and seasons known to harbor the desired species (Reggio et al., 1983). Ditton and Graefe (1978) and Dugas et al. (1979) determined that oil and gas structures are the most popular offshore fishing locations for private and charter boat fishermen in portions of the Western and Central Gulf. As reported by Reggio and others (Proceedings: 1982, pp. 47-75; and 1983, pp. 102-163; and 1984, in press), oil and gas structures are a major focus of all forms of offshore recreational fishing and some types of commercial fishing.

Even though all oil and gas structures erected in the Gulf will function as artificial reefs, the degree to which they affect recreational fishing is believed to be related to the number and size of structures, the length of time they are in place, and their distance from shore and principal access areas. Water depths, oceanic conditions and bottom types around offshore platforms should also affect fishing potential associated with petroleum structures.

Concerns have been expressed that chronic pollution associated with oil and gas operations around platforms will cause sublethal effects on major sport fishing targets which are ultimately harvested and consumed by man. The National Academy of Sciences (1975) and the Norwegian government (Jensen et al., 1983) addressed this concern and concluded that there does not appear to be cause for alarm. Gallaway (1980b) also addressed this specific issue in his studies of the contaminants found in the fish associated with the oil and gas operations at the Buccaneer Oil and Gas Field off Texas. Trace contaminants were noted in some sports fish collected near the platforms; however, these contaminants were not significant and there was little evidence of bioaccumulation. A good summary of the findings of the latest Gulf of Mexico fates and effects studies from drilling and production activities is reported by Defenbaugh (Proceedings: 1982, pp. 75-117). Additionally, as noted in Volume VII, No. 51, of the December 28, 1984, Oil Spill Report, the Norwegian Government has just published a final report entitled, "The Fate of Oil and Its Effects in the Sea," resulting from years of laboratory and field research. Results of their investigations, as regards the effects of oil on fish, corroborate United States' research findings.

It is assumed that people fish offshore for one of three major reasons: to catch more fish; bigger fish; or fish not available inshore. Oil and gas structures are known to affect all these factors in a positive manner. Furthermore, some species not formerly harvested in some areas by recreational fishermen have become regular fishing targets (pompano, for example, off the coast of Louisiana) since the advent of offshore petroleum platforms.

Some offshore sports fishing targets such as snappers and groupers are structure faithful fish, i.e., they are recruited to an artificial structure at some point in their life cycle and will remain associated with that artifical habitat throughout a portion of their remaining lifetime (Gallaway et al., 1981; Gallaway and Lewbel, 1982). Even though MMS supported studies on the effects of oil and gas platforms on natural reefs have been inconclusive (CSA, 1982), it is believed that new artificial reefs have little, if any, significant effect on the carrying capacity or size distribution of fish on natural reefs (Stone et al., 1979). Assuming a constant demand for fish in space and time (fishing pressure), the quantity and quality of offshore fishing will be enhanced in direct proportion to the number and extent of accessible fishing stations or reefs within the fishery.

The more than 4,000 oil and gas structures (Table IV-40) currently in the Central and Western Gulf are de facto artificial reefs augmenting the 93 permitted artificial fishing reefs off Texas, Mississippi, Alabama, and Florida. The front of Visual No. 4-II charts the general location of the 4,200 petroleum structures and designated artificial reefs located throughout the Gulf of Mexico, and on the back of this visual descriptive information about each permitted reef is provided.

Table IV-40

Existing and Projected Number of Structures and Artificial Reefs in the Gulf of Mexico

	Existing Oil & Gas Platforms		Existing Permitted Artificial Reefs		New Petroleum Platforms
Planning Area	OCS	State Waters	OCS	State Waters	1986 Lease Sales
Western	256	200	7	1	20
Central	2,800	800	21	1	20
Eastern	-	-	17	75	-
TOTAL GULF	3,056	1,000	45	77	40

As was established in Volume 1, Section IV.D.1.a.(5) of the Final Regional EIS, the following standard Gulfwide rating scale has been devised for judging the expected impact to offshore recreational fishing from OCS sales:

Very High - Over 80% of the offshore recreational effort in the planning area will be affected by platform development or oil spills for an extended period of time (more than one year).

High - From 40%-80% of the offshore recreational fishing effort in the planning area will be affected by platform development or oil spills for an extended period of time (more than one year).

Moderate - From 10%-40% of the offshore recreational fishing effort in the planning area will be affected by platform development or oil spills for an extended period of time (more than one year).

Low - Less than 10% of the offshore recreational fishing effort in the planning area will be affected by platform development or oil spills for an extended period of time (more than one year).

Very Low - Marine recreational fishing effort anywhere in the planning area will be affected by platform development, oil spills, or other developmental/operational aspects resulting from the lease sale.

Impact Analysis

Table IV-40 presents the total number of existing petroleum structures (de facto reefs) and designated artificial fishing reefs in the Central Gulf, and the expected number of platforms likely to result from Sale 104. Not reflected in this table are the number of platforms likely to be removed in the future or the number yet to be added from former lease sales. In the last few years there have been twice as many structures added as were removed; however, the number of removals is expected to increase at a much faster rate than additions in the next 5-20 years. It has been estimated that under current regulations two-thirds of the major production platforms currently in the Gulf will be removed by the year 2000.

The 20 new platforms projected to result from Sale 104 constitute less than 1% of the existing 2,763 structures currently on the OCS in the Central Gulf. Unless all or most of the 20 new platforms projected to result from Sale 104 are erected within 25 miles of shore and near population centers and major access points, it is unlikely that there will be an appreciable impact on marine recreational fishing in the CPA.

One large oil spill (1,000 bbls or greater) occurrence is assumed as a result of the proposed action. Such a spill would temporarily remove a portion of the area (slick area) from sports fishing activity. Should such a spill occur during a major fishing tournament in the area where fishermen intend to fish, the effects would be greater (more people would be unable to fish). One large spill contact is assumed with marshes and seagrass beds. The marshes of Terrebonne Parish are most vulnerable (5% probability). Such a spill contact is likely to destroy some fish eggs and larvae but is unlikely to be detected by the recreational fishermen in terms of fishing success in future years.

Conclusion

The proposed action is expected to have a very low positive impact on marine recreational fishing in the Central Gulf of Mexico.

Cumulative Impacts

Federal OCS activity is estimated to add 160 offshore platforms in the CPA, which can be viewed as high profile, de facto artificial reefs. These structures would add to the existing 3,600 de facto artificial fishing reefs and 22 permitted artificial fishing reefs already offshore in the Central Gulf of Mexico. Studies and observations have shown that where oil and gas structures are accessible they are significant attractants of offshore fishermen and enhance fishing success. Conversely, pollution and activity associated with the works of man (such as oil and chemical spills, competition between commercial and recreational fishermen and among recreational fishermen, coastal modifications brought on by industrial development and population increases in the coastal zone, and inevitable natural forces such as subsidence, anoxia, floods, and freezes) will affect long-term sociological and ecological changes which will indirectly stress fishery resources important to marine recreational fishermen and could lead to the increase of restrictive regulations affecting fishing enjoyment and participation. Offshore oil and gas activity has had a very high positive level of impact on recreational fishing in the Central Gulf; a continuation of that activity as a result of Federal and State offshore activity is expected to assist in maintaining recreational fishing levels in offshore Louisiana and could lead to a moderate impact on fishing offshore Mississippi and Alabama over the next 50 years. Considering an expected increase in structure removal rate (currently around 40 per year), greater interest in artificial reef development Gulfwide, and an expanding offshore fishing population in general, more interest in the retention and reuse of obsolete oil and gas structures as dedicated reefs in the marine environment is likely. The National Fishing Enhancement Act of 1984 and management measures adopted by NMFS through the planning efforts of the Gulf of Mexico Fishery Management Council will also affect the future of offshore fishing in the CPA.

Conclusion

The estimated level of cumulative impacts on offshore marine recreational fishing in the Central Gulf is expected to be very high off Louisiana and moderate off Mississippi and Alabama.

(10) Impacts on Major Shorefront Recreational Beaches

Volume 1, Section I.B.2. of the Final Regional EIS and subsequent scoping have identified major shorefront recreational beaches as resources of public concern. Major recreational beaches are defined as those frequently visited sandy areas along the shorefront exposed to the Gulf of Mexico which support a multiplicity of recreational activity, most of which is focused at the land and water interface. Included are National Seashores, State Park and Recreational Areas, county and local parks, urban beachfronts, and private resort areas. The general location of these beaches are reflected on Visuals Nos. 4-II and 10 and a Gulfwide listing of specific major Gulf front beaches are individually identified by county on the back of Visual No. 10.

Volume 1, Section III.C.7., Table III-34 of the Final Regional EIS shows that the value of recreation and tourism in the Gulf of Mexico coastal zone has been estimated at over $15 billion annually. Approximately half of this value is ascribed to the Central and Western Gulf where major shorefront beaches are primary attractions. As noted on Visual No. 14, major shorefront recreational beaches comprise an estimated 26% (140 miles) of the exposed linear coastline in the WPA but only 6% (125 miles) of the exposed linear coastline in the CPA.

The primary impacting factor most widely recognized as a major threat to beaches is large oil spills. Other factors associated with offshore sales, such as pipeline landfalls (removal of rights-of-way across beaches during construction), offshore structure development (aesthetic implications), onshore support facility development (displacement of beach area), and lease site operational activity (noise), can directly and indirectly impact shorefront recreational beaches and associated activities. However, none of these other impacting factors are issues or major threats to the integrity or public use characteristics of major Gulf front recreational beaches. NPS has indicated that debris clearly associated with the petroleum industry (oil drums, large plastic containers, hard hats, and tar balls) is an increasing problem on major recreational beaches in the Western and Central Gulf. Removal and disposal of beached 55-gallon drums alone is costing Padre Island National Seashore upwards of $10,000 per year. Others in the Central and Western Gulf have also noted the recurring problem of debris wash-up from offshore petroleum operations affecting beach use, aesthetics, and beach maintenance requirements along the Gulf of Mexico shorefront.

Widely publicized and investigated oil spill incidences such as the Santa Barbara spill of 1969, the Ixtoc spill in 1979, and the Alvenus tanker spill of 1984 have demonstrated that beaches, and recreational use of beaches, can be severely impacted from major spills. Although duplication of Ixtoc or Santa Barbara is considered remote in light of current technology and preventative mechanism in place (Sections I.B.3., 4., and 5), such incidences have occurred and may be conceivable in the future development of energy resources from the Gulf of Mexico. It is important to note, however, that even in these historical worst cases, the damages to the tourism and recreational industries were temporary (less than one year) and compensable (Sections IV.D.1.a.(12) and IV.D.2.a.(12)). Recent findings from an in-depth study of the impact of the Ixtoc 1 oil spill on three south Texas shorefront beach parks indicated no significant decrease in park visitations resulting from the oil spill. The availability of gasoline, however, was shown to have a significant impact on recreation (Freeman et al., in press).

Section IV.B. presents available information on the historic oil spills from United States operations in the Gulf, discusses the oil spill risk analysis developed for this EIS, and provides information on the extent and effectiveness of existing containment and cleanup capabilities. Most relevant to this impact analysis are the assumptions concerning the characteristics, fates, and effects of a Gulf of Mexico oil spill (Section IV.B.4.), stating that the majority of oil spills occurring in the Gulf are likely to dissipate rapidly and only a relatively small fraction is subject to tar ball formation because of the chemical properties of many northern Gulf light crudes. Tar balls are known to remain viable as long as 1-2 years in the marine environment. The analysis of major spills assumes that an originating slick remains an acute threat to shoreline recreational resources for up to 10 days after which natural processes significantly change the nature and form of the pollutant.

Crude oil in its natural, fresh form is a mildly viscous, black to brown liquid substance which tends to float on seawater. When it reaches shore in significant quantities as an oil slick, extensive oiling of white sandy beaches at the critical recreational interface between land and water occurs. The sight, smell, and touch of crude oil seriously offends public sensitivities and renders seriously impacted areas unsuitable for most forms of beach-related recreational activity as long as the oil pollution remains evident. For practical purposes, even less than acute beachings of crude oil can preclude recreational use of beaches or portions of beaches in order to accommodate containment and cleanup operations. Equally as onerous, is extensively weathered oils which have been reduced to widely dispersed globs or tar balls that find their way to major shorefront recreational beaches. Petroleum derivatives encountered on beaches detract from aesthetics and enjoyment of beach use.

As was established in Volume 1, Section IV.D.1.a.(6) of the Final Regional EIS, the following standard Gulfwide rating scale has been devised for judging the expected impact to major shorefront recreational beaches:

Very High - The overall quantity of major recreational beaches in the region will permanently change and/or a persistent change in the quality of a majority of the major beaches will be evident. Sustained regional influence on the beaches or beach-related recreational activities is expected to cause beach administrative and maintenance costs to increse significantly throughout the region.

High - The quality of a small percentage (those associated with at least one community) of major recreational beaches in the region will be permanently affected. Sustained influence (one or more years) on the type and intensity of beach-related recreational activities is expected to influence regional and subregional displacement of recreational use. Sustained pollution or contamination of beaches causes persistent and significant increases in beach maintenance and administrative costs on a subregional basis.

Moderate - The quality of a large percentage (more than one community or political subdivision) of the major recreational beach environment is minimally yet perceivably affected in a sustained manner, yet the level and type of recreational activity is not changed. Acute, short-term damage to individual beaches can occur. Beach administrative and maintenance costs will increase significantly on a short-term basis (less than one year) subregionally.

Low - The quantity or quality of the major recreational beach environment does not change in a perceptible or sustained manner either regionally or subregionally; acute, short-term damage to individual recreational beaches is slight; the influence on one or more beach-related recreational activities is not major; and increases in beach administrative and maintenance costs are short-term and localized.

Very Low - The quantity and quality of major recreational beaches does not change; short-term damage to individual recreational beaches is negligible. Impacts do not preclude recreational use although they may cause minor inconveniences to local users or site administrators. Beach administrative and maintenance costs are unaffected from the base case.

Impact Analysis

It is reasonable to expect that exploration and production on blocks leased in the Central Gulf of Mexico could lead to major oil spills, and those spills could be carried by wind, wave, and currents to interact with major shorefront recreational beaches throughout the Gulf of Mexico. As was made evident from the Alvenus tanker accident, major oil spills occurring in one region (CPA) can impact recreational resources and activities in another region (WPA).

One large spill (1,000 bbls or greater) contact is assumed with land as a result of the proposed action. This spill contact could occur with either of two land segments in Louisiana which have recreational beaches. A number of smaller spills (less than 1,000 bbls) could also occur and contact recreational beaches. The expected impacts of such contacts are likely to cause short-term displacement of recreational activity on the areas affected; however, the quantity or quality of the recreational environment would not be changed in a sustained manner. Should major beaches such as Grand Isle State Park on the east end of Grand Isle, Louisiana, be impacted (3% probability) during the summer, some adverse social and economic impact (Sections IV.D.1.a.(12) and IV.D.2.a.(12)) would be realized throughout the local community and some quick-fix remedies such as sand removal and associated disposal problems would ensue, which would impact the sand budget on the beach. Vehicles such as trucks, loaders, and graders tend to grind the oil deeper into the beach sand, causing long-term impacts to beach use.

Conclusion

The proposed action is estimated to have a low expected impact on the quantity, quality, and use of major shorefront recreational beaches in Louisiana. No impacts are estimated for major recreational beaches in Mississippi, Alabama, and Texas.

Cumulative Impacts

Two large spills (1,000 bbls or greater) and a number of smaller spill contacts are assumed with major shorefront recreational beaches in Louisiana, Mississippi, Alabama, and/or Texas. Such spill contacts which would occur between 1986 and 2006 are expected to result in short-term disturbances, causing temporary loss or displacement of water-related, nearshore recreational activity on specific beaches directly or indirectly impacted. Furthermore, it is important to realize, especially in the cumulative impact context, that of all chronic hydrocarbon pollution existing in the Gulf, less than 2% is directly related to Gulf of Mexico oil and gas leasing and production (Section IV.B.3.a.). Continued and expanded oil and gas operations in the CPA will contribute to the already serious problem of debris and trash on coastal beaches. This detracts from the aesthetic quality and can be hazardous to beach recreational activity and increase the cost of beach maintenance programs. Other factors such as offshore commercial and recreational fishing, as well as recreational use of beaches, State oil and gas tankering, pipelines, operational discharges, condos, etc., contribute to the trash and debris problem currently existing on the major recreational beaches of Louisiana, Texas, and Mississippi.

Conclusion

The overall expected level of cumulative impact to major recreational beaches is estimated to be moderate.

(11) Impacts on Cultural Resources

Since, in any archaeological site, the most important information is contained in the horizontal and vertical position of an artifact or cultural feature, in relation to other cultural objects or the natural environment, any activity which disturbs that context is destroying potentially valuable archaeological data.

The major impact producing factors are emplacement of drilling rigs, production platforms, and pipelines. These activities would also result in tons of new ferromagnetic structures and debris offshore which would tend to mask magnetic signatures of significant cultural resources, should future surveys be attempted. Onshore, support, and processing facilities would also have the potential for directly impacting sites through physical alteration or destruction of site components.

Indirect impacts to onshore and offshore archaeological sites could result from both major oil spills and chronic, low level hydrocarbon contamination. These indirect impacts would include destruction of the C-14 dating potential of prehistoric sites, and visual impacts to sites through direct contamination of a site or contamination of the surrounding environment. Direct physical impact may also result to beach sites through clean-up operations.

Considering the uniqueness of the archaeological data which may be lost as a result of the proposal, the following criteria of significance were developed:

Very High	- An interaction between an archaeological site and an impact producing factor occurs and results in the loss of unique archaeological information.
High	- An interaction between an archaeological site and an impact producing factor occurs and results in the loss of important archaeological information; however, it is assumed that other sites containing similar information exist.
Moderate	- An interaction between an archaeological site and an impact producing factor occurs and results in the loss of archaeological data that are not unique.
Low	- An interaction between an archaeological site and an impact producing factor occurs, but impacts are temporary and reversible.
Very Low	- Little damaging interaction between an impact producing factor and an archaeological site occurs.

(a) Historic

Shipwrecks located on the OCS would have to be assessed individually to determine their uniqueness and the amount of information they might provide to our Nation's maritime heritage.

Onshore historic sites would also have to be assessed individually to determine the uniqueness or importance of the data they contain. However, sites already listed on the National Register of Historic Places, and those considered eligible for the Register (Visual No. 11) have already been evaluated as being able to make a unique or significant contribution to science.

Impact Analysis

Offshore development could result in an interaction between a drilling rig, platform, pipeline, or anchors and an historic shipwreck. This direct interaction with a shipwreck site would destroy fragile ship remains, such as the hull and wooden or ceramic artifacts, and would disturb the context of the entire site. The result would be the loss of archaeological data on ship construction, cargo, and social organization of the vessel's crew, and the concomitant loss of information on maritime culture for the time period from which the ship dates.

For purposes of this analysis, it is assumed that some shipwrecks in the Central Gulf contain unique information on ship construction and on maritime culture, and that others contain information available from other sources, the impact, should an interaction occur, would be moderate or very high (depending on the uniqueness of the data lost).

For each subplanning area in the CPA, Table IV-41 shows the percentage of blocks which fall within cultural resources Zone 1 (Visual No. 11) where there is a high probability for the occurrence of shipwrecks. Using this percentage, the number of exploration and delineation wells, platforms, and miles of pipeline which would occur within Zone 1 were calculated. These potential interactions with historic resources were then totaled. Based on these figures, the risk of impacts occurring to historic shipwrecks as a result of offshore development from Sale 104 would be high; however, the cultural resources lease stipulation described in Section II.A.1.c.(3) will reduce this high potential for an interaction by allowing identification of significant historic resources prior to development, thereby making avoidance or mitigation of potential impacts possible.

Table IV-41

Estimated Risk of Impacts Occurring to Cultural Resources
Central Gulf (Sale 104)

Subarea	Approximate Number of Blocks	Number of Blocks Within Cultural Resources Zone 1	%	Number of Blocks Within Cultural Resources Zones 1 & 2	%	Exploration & Delineation Wells Total	Exploration & Delineation Wells Zone 1	Exploration & Delineation Wells Zones 1 & 2
C-1	1,707	798	47	1,164	68	98	46 (47%)	67 (68%)
C-2	3,190	733	23	788	24	154	35 (23%)	37 (24%)
C-3	3,320	148	4	271	8	98	4 (4%)	8 (8%)
C-4	277	137	49	269	97	10	5 (49%)	10 (97%)
Totals	8,494	1,816	-	2,492	-	360	90	122

Subarea	Platforms Total	Platforms Zone 1	Platforms Zones 1 & 2	Miles of Pipeline* Total	Miles of Pipeline* Zone 1	Miles of Pipeline* Zones 1 & 2	Total of Possible Interactions in Zone 1	Possible Interactions in Zone 1 after Applying Lease Stipulations Eastern CPA	Possible Interactions in Zone 1 after Applying Lease Stipulations Western CPA	Total of Possible Interactions in Zones 1 & 2	Possible Interactions in Zones 1 and 2 after Applying Lease Stipulations
C-1	5	2 (47%)	3 (68%)	80	38 (47%)	54 (68%)	61	43-46	6	88	9
C-2	9	2 (23%)	2 (24%)	80	18 (23%)	19 (24%)	43	30-32	4	45	4
C-3	5	0 (4%)	0 (8%)	50	2 (4%)	4 (8%)	5	3-4	0	9	1
C-4	1	0 (49%)	1 (97%)	10	4 (40%)	10 (97%)	6	4	1	14	1
Totals	20	4	6	220	62	87	115 (high)	80-86 (high)	11	156 (high)	15 (low)

*One interaction = 3 miles of pipeline.

In the eastern portion of the Central Gulf where unconsolidated sediments are generally thick, it is more likely that shipwrecks present within a survey area would not be detected by the side scan sonar. In this area, which begins around South Marsh Island Area and extends eastward, the effectiveness of the survey in detecting historic shipwrecks of composite and wooden construction would be approximately 25%-30% (Volume 1, Section II.A.1.c.(2), Table II-2 of the Final Regional EIS). In this area, the stipulation would reduce the risk of an interaction by 25%-30% or from high to moderate. Therefore, although the impact to historic sites in the eastern portion of the Central Gulf, should an interaction occur, would be moderate to very high. Considering the moderate risk for an interaction occurring, the expected impact would be moderate or high.

In the western portion of the Central Gulf where shipwrecks are more likely to be detected by the side scan sonar, the risk of an interaction would be reduced by an estimated 90%, or from high to low. Therefore, although the impact to historic sites in the western portion of the Central Gulf, should an interaction occur, would be moderate to very high, considering the low risk for an interaction occurring, the expected impact would be low or moderate.

Onshore development as a result of the proposed action could result in an interaction between construction of new onshore facilities and an historic site. This direct interaction with an historic site would cause physical damage to, or complete destruction of, historic sites, structures, and artifacts, and would disturb the context of the entire site. The result would be the loss of information on the cultural history of the region and the Nation. Often information contained in historical sites is unrecorded in written historical accounts. A site which contains such previously undocumented information may be the only surviving source of that information.

If it is assumed that, of the coastal historic sites which may be impacted by onshore development, some contain unique information and that others contain information available from other sources, the impact, should an interaction occur, would be moderate or very high (depending on the uniqueness of the data lost).

Under the M Scenario, the number of acres projected for disturbance from new onshore facilities in the Central Gulf is between 215 and 915. Due to the low amount of acreage projected for disturbance, the visibility of most onshore historic sites, and State and Federal cultural resources laws which require consideration of historic properties if any State or Federal funding or permits are required for construction, the risk of an interaction between an impact producing factor and a significant historic resource as a result of the projected onshore development is assessed as being low. Therefore, although the impact to onshore historic sites, should an interaction occur, would be moderate to very high, considering the low risk for an interaction occurring, the expected impact would be low or moderate.

One large (1,000 bbls or greater) and several smaller oil spill contacts are assumed with coastal archaeological sites (historic and prehistoric) as a result of the proposed action. Should one or more of these spill contacts be with a coastal historic site such as forts and lighthouses, the major impact would be visual due to oil contamination of the site and its environment. This impact would probably be temporary and reversible with no actual loss of information. Based on the criteria of significance outlined above, the impact to coastal historic sites from an oil spill would be low. It is noted that the probability of a major spill contact is low (a 1% chance, Table IV-19). Considering the low level of impact which would result to coastal historic sites should an oil spill contact occur, and the low risk of a contact occurring, the expected impact would be very low.

The impact levels to historic sites, should an interaction occur with an impact producing factor from offshore development, onshore development, or oil spill, range from low to very high depending on the type of interaction and the uniqueness of the data lost as a result of the interaction. However, the risk of these impacts occurring is low with the exception of impacts from offshore development in the eastern portion of the Central Gulf, which is assessed as being moderate.

Conclusion

The estimated level of impact to historic sites in the Central Gulf as a result of the proposed action is estimated to be moderate.

Cumulative Impacts

Other major factors which would affect significant historic cultural resources in the Central Gulf include trawling, sport diving/commercial treasure hunting, hurricanes, channel dredging, previous oil and gas development, and chronic, low level hydrocarbon contamination.

The most intensive areas of trawling in the Central Gulf are represented by the areas outlining the centers of abundance for white shrimp (Visual No. 4-I). Extensive trawling within these areas would probably only affect the upper 3 inches or so of sediment (NERBC, 1980) due to the limited vertical extent of disturbance associated with trawling. With shipwreck sites, it would seem likely that any site components within 3 inches of the present seabed would be affected should the area be trawled. On many wrecks, this zone would already be disturbed by natural factors and would contain artifacts of low specific gravity which have lost all original context and have been heavily abraded (Muckelroy, 1978). Therefore, the effect of trawling on most historic shipwreck sites would probably be very low.

Sport diving and commercial treasure hunting are a significant factor in the loss of historic data from wreck sites. While commercial treasure hunters generally impact wrecks with intrinsic monetary value, sport divers may collect souvenirs from all types of wrecks. The impact from these activities cannot be quantified.

About half of the coast along the Central Gulf was hit with 16-20 tropical cyclones between the years 1901-1955 (DeWald, 1980). The other half, between Atchafalaya Bay and Texas, had a slightly lower incidence of cyclones (11-15). Seven major hurricanes also crossed the Central Gulf between the years 1954-1977. Shipwrecks in shallow waters are exposed to a greatly intensified longshore current during tropical storms (Clausen and Arnold, 1975). Under such conditions, it is highly likely that artifacts of low specific gravities (e.g., ceramics and glass) would be dispersed, leaving only the denser materials (iron, steel, ballast, and conglomerates) at the original site. Much of the original information contained in the site would be lost in this process, but a significant amount of information would also remain. Overall, a significant loss of data from historic and prehistoric sites has probably occurred, and will continue to occur, in the Central Gulf from the effects of tropical storms. Assuming that some of the data lost has been unique, this impact would be very high.

Because most channel dredging occurs at entrances to bays, harbors and ports, there is a high probability for impacts to historic sites because of high site densities in these areas. Assuming that some of the data lost have been unique, the impact to historic sites as a result of past channel dredging activities, would be very high. In many areas, COE now requires remote sensing surveys prior to dredging to minimize such impacts.

In late 1983, there were approximately 3,600 platforms in the CAA, and about 18,000 exploration and development wells had been drilled which is more than 4.5 times the number of exploratory and development wells estimated to result from future Federal OCS activity in the Central Gulf under the cumulative scenario. The first of these wells was drilled in 1947 prior to enactment of the legislation on which the cultural resources surveys have been based for the past 10 years. Although information on the chronological distribution of this development is not available for this analysis, development reached its peak after the cultural resources survey requirement began. Assuming that the cultural resource surveys, which have been required prior to lease development over the past eight years, have been (on an average) 60% effective in locating historic shipwrecks, the major impacts would have resulted from development prior to 1974. Although no estimate as to the potential loss can be made due to the magnitude of this previous oil and gas activity, it is assumed that the loss of unique archaeological data in the Central Gulf has been very high.

One large spill (1,000 bbls or greater) and several smaller spill contacts are assumed with coastal archaeological sites (historic and prehistoric) under the cumulative scenario. It has been estimated that the annual input of petroleum into the Gulf from all sources approaches 2.3 million bbls. This chronic hydrocarbon contamination could have an impact on cultural resources. However, since the impacts to historic sites from oil contamination are generally short-term and reversible, the expected cumulative impacts from oil contamination are estimated to be low.

Conclusion

The estimated level of cumulative impacts on the historic cultural resource base in the Central Gulf is expected to be very high.

(b) Prehistoric

Any in situ prehistoric site located on the Gulf of Mexico OCS would be completely unique at this point in time. As more sites are discovered, those along relict shorelines, seaward of about the 20 m isobath, will provide unique archaeological data on coastal adaptations prior to the Late Archaic period. Such information is unavailable from terrestrial sites in North America because coastal areas for all cultural periods prior to the Late Archaic are currently submerged on our continental shelves. Archaeological data on prehistoric migrations, settlement patterns, and cultural contacts across now submerged land masses is also information which can only be obtained from submerged sites on the OCS.

Onshore prehistoric sites would have to be assessed individually to determine the uniqueness or importance of the data they contain. However, sites already listed on the National Register of Historic Places, and those considered eligible for the Register (Visual No. 11), have already been evaluated as being able to make a unique or significant contribution to science.

To assess the relative risk of an impact occurring, the following criteria will be used:

Impact Producing Factor	Risk		
	Low	Moderate	High
Offshore Development	Less than 50 potential interactions	50-100 potential interactions	More than 100 potential interactions
Onshore Development	Less than 1,000 acres of disturbance projected	1,000-2,500 acres of disturbance projected	More than 2,500 acres of disturbance projected
Oil Spills	Less than a 25% probability of a spill of 1,000 bbls or greater contacting a coastal archaeological site	25%-50% probability of a spill of 1,000 bbls or greater contacting a coastal archaeological site	More than a 50% probability of a spill of 1,000 bbls or greater contacting a coastal archaeological site

Impact Analysis

Offshore development as a result of the proposed action could result in an interaction between a drilling rig, platform, pipeline or anchors and an inundated prehistoric site. This direct interaction with a site would destroy fragile artifacts or site features and would disturb the context of the entire site. The result would be the loss of archaeological data on prehistoric migrations, settlement patterns, subsistence strategies, and cultural contacts for North America, Central America, South America, and the Caribbean.

Due to the fact that any in situ prehistoric site located in the Central Gulf would provide unique information at this point in time and that many will provide unique information not available from any other sites (terrestrial or inundated), the impact, should an interaction occur, would be high to very high.

For each subplanning area in the CPA, Table IV-41 shows the percentage of blocks which fall within cultural resources Zones 1 and 2 (Visual No. 11) where there is a high probability for the occurrence of prehistoric sites dating prior to 3,000 B.P. Using this percentage, the number of exploration and delineation wells, platforms, and miles of pipeline which would occur within Zones 1 and 2 as a result of the proposed sale were calculated. The potential interactions with prehistoric resources were then totaled. Based on these figures, the risk of impacts occurring to prehistoric sites as a result of offshore development from Sale 104 would be high; however, the cultural resources lease stipulation will reduce this high potential for an interaction by allowing identification of significant prehistoric resources prior to development, thereby making avoidance or mitigation of potential impacts possible. Assuming that the survey provided for by the lease stipulation is 90% effective in evaluating prehistoric site potential within a survey area (see analysis in Section II.A.1.c.(2) and Table II-2 of the Final Regional EIS), the lease stipulation will reduce the total number of possible interactions by 90%, thereby reducing the risk from high to low. Therefore, although the impact to prehistoric sites, should an interaction occur, would be high to very high, considering the low risk for an interaction occurring, the expected impact would be low to moderate.

Onshore development as a result of the proposed action could result in an interaction between construction of new onshore facilities and a prehistoric site. This direct interaction with a prehistoric site would destroy fragile artifacts or site features and would disturb the context of the entire site. The result would be the loss of information on the prehistory of North America and the Gulf Coast Region.

If it is assumed that, of the coastal prehistoric sites which may be impacted by onshore development, some contain unique information and that others contain information available from other sites, the impact, should an interaction occur, would be moderate to very high (depending on the uniqueness of the data lost).

Under the M Scenario, the maximum number of acres projected for disturbance from new onshore facilities in the Central Gulf is between 215 and 915. Due to the low amount of acreage projected for disturbance, and State and Federal cultural resources laws which require consideration of cultural resources if any State or Federal funding or permits are required for construction, the risk of an interaction between an impact producing factor and a significant prehistoric resource as a result of the projected onshore development is assessed as being low. Therefore, although the impact to onshore prehistoric sites, should an interaction occur, would be moderate to very high, considering the low risk for an interaction occurring, the expected impact would be low to moderate.

One large (1,000 bbls or greater) and several smaller oil spill contacts are assumed with coastal archaeological sites (historic and prehistoric) as a result of the proposed action. Should one or more of these spill contacts be with a coastal prehistoric site, the potential for dating the site using Carbon-14 would be destroyed. However, if diagnostic artifacts are present in the site, loss of C-14 dating potential may not constitute a loss of unique information; therefore, the impact would be moderate.

Previously unrecorded coastal sites may suffer direct physical impact from beach cleanup operations. Interactions of cleanup equipment with a site would destroy fragile artifacts or site features and would disturb the context of the entire site. The result would be the loss of information on the prehistory of North America and the Gulf Coast Region.

If it is assumed that, of the coastal prehistoric sites that may be impacted by beach cleanup operations, some contain unique information and that others contain information available from other coastal sites, the impact, should an interaction occur, would be moderate to very high (depending on the uniqueness of the data lost).

It is noted that the probability of a major spill contact is low (a 1% chance based on the OSRA, Table IV-19). Therefore, although the impact which would result to a coastal prehistoric site, should an oil spill contact occur, would be moderate to very high, considering the low risk of a contact occurring, the expected impact would be low to moderate.

The impact levels to prehistoric sites, should an interaction cccur with an impact producing factor from offshore development, onshore development, or an oil spill, range from moderate to very high depending on the type of interaction and the uniqueness of the data lost as a result of the interaction. However, the risk of any of these impacts occurring is low.

Conclusion

The expected level of impact to prehistoric sites in the Central Gulf as a result of the proposed action is expected to be moderate.

Cumulative Impacts

Other major factors which would affect significant prehistoric cultural resources in the Central Gulf include trawling, hurricanes, channel dredging, previous oil and gas development, and chronic, low level hydrocarbon contamination.

The most intensive areas of trawling in the Central Gulf are represented by the areas outlining the centers of abundance for white shrimp (Visual No. 4-I). Extensive trawling within these areas would probably only affect the upper 3 inches or so of sediment (NERBC, 1980). Due to the limited vertical extent of disturbance associated with trawling, it is unlikely that any prehistoric sites would be affected.

About half of the coast along the Central Gulf was hit with 16-20 tropical cyclones between the years 1901-1955 (DeWald, 1980). The other half, between Atchafalaya Bay and Texas, had a slightly lower incidence of cyclones (11-15). Seven major hurricanes also crossed the Central Gulf between the years 1954-1977. These storms would affect coastal prehistoric sites on barrier islands and beach fronts by erosion and reworking of sediments which would either destroy or change the context of site components. When the number of tropical storms recorded within this century is multiplied by 30 (for sites approximately 3,000 years old), it seems highly likely that many exposed coastal prehistoric sites have been, and will continue to be, destroyed by such storms. Assuming that some of the data lost has been unique, this impact would be very high.

Because most channel dredging occurs at entrances to bays, harbors and ports, there is a high probability for impacts to prehistoric sites because of high site densities in these areas. Assuming that some of the data lost have been unique, the impact to prehistoric sites, as a result of past channel dredging activities, would be very high. In many areas, COE now requires remote sensing surveys prior to dredging to minimize such impacts.

In late 1983, there were approximately 3,600 platforms in the CPA, and about 18,000 exploration and development wells had been drilled (which is more than 4.5 times the number of exploratory and development wells estimated to result from future Federal OCS activity in the CPA under the cumulative scenario). The first of these wells was drilled in 1947 prior to enactment of the legislation on which the cultural resources surveys have been based for the past 10 years. Although information on the chronological distribution of this development is not available for this analysis, development reached its peak after the cultural resources survey requirement began. Assuming that the cultural resource surveys, which have been required prior to lease development over the past eight years, have been 90% effective in identifying areas having a high probability for the occurrence of prehistoric sites, the major impacts would have resulted from development prior to 1974. Although no estimate as to the potential loss can be made due to the magnitude of this previous oil and gas activity, it is assumed that the loss of unique archaeological data in the Central Gulf has been very high.

One large spill (1,000 bbls or greater) and several smaller spill contacts are assumed with coastal archaeological sites (historic and prehistoric) under the cumulative scenario. In addition, it has been estimated that the annual input of petroleum into the Gulf from all sources approaches 2.3 million bbls. This chronic hydrocarbon contamination is much more significant in its potential impact on cultural resources. The most serious effect of oil contamination is the alteration of the carbon content of organic materials in coastal prehistoric sites. This contamination may result in erroneous C-14 dates and the possible loss of all dating potential for a site. Thus, the loss of significant prehistoric site data may be very high.

Conclusion

The estimated level of cumulative impacts on the prehistoric cultural resource base in the Central Gulf is expected to be very high.

(12) Impacts on Tourist Activity/Industry

The importance of tourism to the economy of the coastal region has been discussed in Section III.C.10. Much of the tourism and associated travel expenditures is related to beach use, particularly in Cameron, Galveston, Nueces, and Brazoria Counties in Texas and the Hancock County area (including Harrison and Jackson Counties in Mississippi). Other beaches are located in Cameron and Jefferson Parishes of Louisiana, in Mobile and Baldwin Counties of Alabama, and in Jefferson, Kenedy, and Kleberg Counties of Texas. A detailed discussion of the availability of beaches along the Gulf coastline is contained in Section IV.D.1.a.(10) regarding major shorefront recreational beaches. This information is also relevant to tourism beaches, which are virtually synonymous with popular recreation beaches along the Gulf shoreline. The emphasis of the tourism analysis, however, differs from the recreation sector by concentrating on economic impacts of the leasing program on tourism. Tourists are defined as travelers who are generally more than 100 miles from their current residences.

The impacts associated with tourism are primarily related to the expected number of oil spills that contact tourist beaches as a result of Federal OCS sales. Previous leasing experience in Gulf of Mexico OCS waters has shown that other impact producing factors, such as rig or platform siting or oil/gas field vessel traffic, have had only slight, if any impacts on beach-related tourism activities.

The analysis of this oil spill-related impact is based on the results of the OSRA. These results were applied to existing data on tourist expenditures by county or parish in order to quantify the expected economic losses over the life of the proposed sales. The net effects of oil spills that are expected to reach Gulf beaches are based on associated projections of reduced tourism expenditures on such items as food, lodging, and automotive services.

There are several important assumptions that relate the expected number of oil spills contacting a particular area to the resultant losses of tourism receipts. First, it has been assumed that such spills will contact the beaches during the height of the tourist season and that the duration of the spill (2-6 weeks) will affect 50% of an area's total peak season receipts. It is assumed that the tourism receipts in affected Gulf Coastal counties are directly related to the quality of shorefront beaches in proportion to tourism beach use. For the various coastal counties, the percentage of tourism that is beach-related ranges from 1%-100%, and the percentage of tourism that occurs during peak season ranges from 25%-70%. It is assumed that the percentage of total beach area affected by one spill of 1,000 bbls or greater would be 100% in each coastal county in this analysis. Smaller spills (less than 1,000 bbls) may occur and, in proportion to their magnitude, are expected to have less serious impacts. An oil spill may be assumed, in some cases, to affect beaches in more than one analysis area.

The difference between the with and without proposed action projections of tourism losses represents the proposal's net impact on tourism. This net effect can then be compared to total tourism expenditures for the same time period and planning area in order to determine its relative importance to the entire tourist industry. The following impact evaluation criteria will be used in making this comparison:

Very High - The net effect of a change in tourism expenditures within an area is considered very high if it exceeds 20% of the area's tourism expenditures expected without the proposed action.

High - The net effect is considered high if it represents 16%-20%, inclusive, of the tourism expenditures expected without the proposed action.

Moderate - The net effect is considered moderate if it represents 11%-15%, inclusive of the tourism expenditures expected without the proposed action.

Low - The net effect is considered low if it represents 6%-10%, inclusive, of the tourism expenditures expected without the proposed action.

Very Low - The net effect is considered very low if it represents 5% or less of the tourism expenditures expected without the proposed action.

Impacts Analysis

Increased levels of oil and gas production could increase the chance of an oil spill in the Gulf region. The area that is potentially affected by an oil spill in the CPA includes beaches in Louisiana, Mississippi, Alabama, and Texas. Reductions in income for beachfront motels and restaurants may result from an oil spill that contacts beaches or from other factors such as accumulations of trash and debris. The assumed number of large spill (1,000 bbls or greater) contacts with recreational beaches is one. The only recreational beaches that have a reasonably foreseeable chance (1% or greater) of being contacted by a spill are in Cameron and Jefferson Parishes, Louisiana. In these parishes, the amount of tourism that is related to beach use is very low. The amount of tourism at peak season ranges from 25%-50%. Travel expenditures in 1982 were $5.1 million for Cameron Parish and $295.8 million for Jefferson Parish. For the potentially affected area, travel expenditures were $1,110.6 million. A spill contact with the recreational beaches in these parishes could cause total tourism losses as follows: Cameron - $0.006 million and Jefferson - $1.48 million. This effect on tourism expenditures would be greatest during the year of the spill but would amount to losses of only 0.125% for Cameron or 0.5% for Jefferson Parishes. The maximum loss would be less than 1% for the potentially affected area. Therefore, the net effect on tourism expenditures would be very low. The effect on employment, payroll, and tax receipts are assumed to be very low because of the limited duration (2-6 weeks) of the spill. The probability that a spill contact would occur in these areas is very low: 2% in Cameron and 1% in Jefferson. Therefore, a spill contact is considered unlikely.

Conclusion

The expected impact of the proposed action on tourism activity in the Gulf region is estimated to be very low.

Cumulative Impacts

For the cumulative analysis, tourism activity in the Gulf region is expected to be affected more extensively. Estimates of expected losses to tourism in the Central Gulf and potentially affected adjacent areas are based primarily on oil spills from past sales in the OCS and the proposed action. Impact producing factors not related to the Federal leasing program, include sales in State waters and spills from tankers carrying imported oil. In addition, tourism may be adversely affected by increases in population pressure, beach use, debris accumulations, and offshore commerce. Expansion of residential, commercial, and industrial development along shorefront areas reduces beach access and exacerbates other adverse effects by restricting alternative choices for tourism.

Average annual tourism losses from oil spills could occur in Louisiana, Mississippi, Alabama, and Texas. The assumed number of large spill (1,000 bbls or greater) contacts with Gulf beaches that are important for tourism is two. The coastal areas that have a reasonably foreseeable chance (1% or greater) of being contacted by one of these spills are Cameron and Jefferson Parishes in Louisiana, the Hancock County area in Mississippi (including nearby beaches in Harrison and Jackson Counties), the Mobile County area in Alabama (including recreational beaches in Baldwin County), and, in the WPA, Galveston and Jefferson Counties in Texas. One large spill contact with the recreational beaches in these areas, in association with other adverse impacts, could cause total tourism losses as presented in Table IV-42. Such losses would be most intense during the immediate periods of the spills. Losses are assumed to be equivalent to 100% of an area's peak season receipts that are related to beach use because of the effects of the oil spill in combination with the impacts of population pressure, beach use, debris, and offshore commerce.

The impact of such a spill on tourism expenditures is considered very high for the Hancock County area and Galveston County, low for Mobile County and Jefferson County, and very low for the remaining areas. The effect on employment, payroll, and tax receipts are assumed to be very low because of the limited duration (2-6 weeks) of each spill.

Because of the extensive oil and gas development in State waters, one or more spills in these areas may occur that will contact beaches important for tourism. The impacts of a spill in State waters are assumed to be comparable to impacts from a spill that results from OCS leasing, i.e., very high for the Hancock County area and Galveston County, low for Mobile County and Jefferson County, and very low for the remaining areas.

As domestic production declines, imports will increase and the number of spills and operational discharges from tankers may increase. Technological improvements in transportation facilities may offset this possibility. If spills occur, however, tourism losses could be comparable to those discussed above for a spill from the OCS, i.e., very high for the Hancock County area and Galveston County, low for Mobile County and Jefferson County, and very low for the remaining areas.

In addition to oil spills, impacts to tourism include increases in trash, debris, and accumulations of congealed hydrocarbons (tarballs) washing up on major Gulf of Mexico shorefront beaches and parks, which poses a problem that adversely affects the aesthetics of beach and park use and contributes to administrative and maintenance problems. The causes of the debris seem to be oil and gas operations, the large increase in population near the Gulf of Mexico, and a steady increase in beach use, offshore commerce, and fishing. The primary cause of tarballs seems to be operational discharges from marine vessels.

Accidents associated with offshore oil and gas operations and weather (wind and waves) result in trash and debris entering the ocean and ultimately contributing to beach litter problems. Consequently, trash and debris are considered as an unavoidable adverse impact associated with the Federal leasing program. Part 5 of OCS Order No. 1, Part 1.2 of OCS Order No. 7, and associated regulations (30 CFR 250.43 and 250.54) were developed and applied to Federal lessees and their contractors in order to minimize and mitigate OCS contributions to ocean litter and its attendant environmental problems.

The maximum level of cumulative impacts is based on an assumption of two large spill contacts in association with other adverse impacts in the counties where tourism losses are greatest, i.e., the Hancock County area and Galveston County (Table IV-42). However, a spill could occur in other counties, where the impacts would be less severe. Tourism losses in the area could range from a low of $0.01 million in Cameron Parish, Louisiana, to a high of $107.5 million in the Hancock County area of Mississippi. The maximum impact to the area would be a total tourism loss of $159.9 million, which represents 14% of average annual tourism receipts. Therefore, the net effect on tourism expenditures in the area would be moderate. The probability that such a spill contact would occur is rather high (41%) in Galveston County (where impacts would be moderate) and in Cameron and Jefferson Parishes (where the probabilities are 41% and 44%, respectively, and the impacts would be very low).

Table IV-42

Expected Average Annual Beach-Related Tourism Losses[1] (Cumulative Analyses for the Central Planning Area)

	Total Losses Per Spill			
Area of Impact	$ (million)	%[2]	Assumed No. of Spills	Expected Impact Level
Louisiana[3]				
Cameron Parish	0.01	0.2%	1	Very Low
Jefferson Parish	2.8	1.0%	1	Very Low
Mississippi				
Hancock County Area (including Hancock, Harrison, and Jackson Counties)	107.5	50.0%	1	Very High
Alabama				
Mobile County Area (including Mobile and Baldwin Counties)	14.4	6.8%	1	Low
Texas				
Galveston County	52.4	24.7%	1	Very High
Jefferson County	10.2	6.0%	1	Low
Area Maximum[4]	159.9	14.0%	2	Moderate

[1] Losses are based on the assumed number of large spills (1,000 bbls or greater) contacting recreational beaches.

[2] Percent figures represent proportions of total tourism receipts in the coastal region (beach and non-beach related) in 1983.

[3] Projections for Louisiana are based on 1982 data. For other areas, 1983 data were used.

[4] Assumes two spill contacts in counties (one spill contact with each county) with greatest tourism losses (Hancock County area and Galveston County).

Conclusion

Under the cumulative impact assessment, the expected impacts of the proposed action on tourism activity in the Gulf region are very low in Louisiana, low in Alabama and Jefferson County, Texas, and very high in Mississippi and in Galveston County, Texas.

(13) Impacts on Military Use/Warning Areas

In order to analyze the impacts of oil and gas operations on military operations within the Gulf warning areas and water test areas, five parameters have been identified as potential impact producers. These parameters include: (a) types of military operations; (b) frequency of military operations; (c) intensity of military operations; (d) location of leased tracts and resultant activity within a warning area; and (e) increase in vessel and air traffic into military warning areas due to oil and gas exploration and development.

A discussion and impact assessment for each parameter are given below. Assessment of these factors is based primarily upon knowledge of past military operations throughout the Central and Western Gulf. Because the Navy and Air Force have not provided any indication of intended future operations, frequency of missions, or the spatial extent of missions during scoping or in reply to resource requests, a full assessment of each of these parameters is not possible. Projections of oil and gas activity have been determined from Visual No. 13 and from MMS estimates for the proposed sales based on evaluations of undiscovered resources.

The impacts of oil and gas activities will be higher within those areas with continuous use as opposed to the areas with intermittent use. However, the potential exists for escalating oil and gas activities to alter the frequency of Navy and Air Force use of seven of the warning areas and the water test area.

At this time it is not possible to indicate where the leased blocks will be within each warning area. Using past lease sales and development of the Central and Western Gulf as indicators, it is likely that the leased blocks will be scattered in the area of high potential development (Visual No. 13) and clustered in the deeper water area of moderate resource potential development.

Blocks leased for oil and gas exploration and production can have an impact on military operations dependent on the location of the blocks and resultant exploration and production activities within the warning area.

It is military policy to fly over the mission range and target area prior to a final "live" run on the target. This check to clear the range and target areas before gunnery practice and missile testing is a precaution to prevent the loss of life and equipment if there are oil- and gas-related service boats and helicopters crossing the firing range or target area.

The resolution of the degree of the impacts has resulted from the assessment of the influence of oil and gas activity on the primary function of military use in the Central and Western Gulf.

Very High	- DOD areas would have to be completely shifted, curtailed, or eliminated. Extensive alterations or reductions to military operations would be required.
High	- DOD areas would have to be somewhat shifted or reduced. Significant alterations or reductions to military operations would be required.
Moderate	- DOD areas would have to be shifted or reduced slightly. Moderate alterations or reductions to military operations would be required.
Low	- DOD areas would have minimal overlap with resource development areas. Almost no alterations or reductions to military operations would be required.

Very Low - No alterations or reductions of military operations would be required.

Impact Analysis

Ten percent, or 4,078,000 acres, of the water and air space of the Central Gulf is used for the various military operations within three warning areas (Visual No. 11).

Military Use of Warning Areas

Warning Area	Frequency of Use	Period of Use
W-155	Continuous	Mon.-Sat.,daytime
W-453	Intermittent	Daytime use-7 days/week
W-92	Continuous	1:00 p.m.-6:00 a.m.

Source: U.S. DOD, DMA, 1982b.

W-453 is an Air National Guard training area, and W-92 is a Naval Air Reserve training area. In both areas, use may be infrequent and heavier on particular days of the week (weekends) or a particular time of the year (summer).

An intensive use of W-92 or W-453 has not been indicated by the Navy or Air Force in the past. W-92 and W-453 have had very little oil and gas development; consequently, past impacts of oil and gas development have been very low.

Sale 104 could result in significant adverse impacts on carrier flight qualification operations conducted in Warning Area 155, south of Pensacola. Aircraft carrier qualification operations in Warning Area 155 are critical to the training of U.S. Navy pilots, naval flight officers, and enlisted aircrewmen. These Navy personnel are being prepared to assume flying responsibilities in forward deployed naval aviation units throughout the world. A proposal to relocate these operations further seaward would not be feasible due to the fuel limitations of training aircraft and the associated requirement to keep them within safe flying distances of emergency divert fields ashore. It should be noted that existing oil and gas exploration and development platforms could significantly degrade training operations in Warning Area 155, particularly that portion nearest emergency divert fields. In addition, the extensive numbers of oil and gas leases acquired by the petroleum industry in the Central Gulf, as a result of Sale 72, suggests that at some future point carrier qualification operations in Warning Area 155 will have to cease altogether for safety reasons unless restrictions are imposed on future sales.

To accommodate the Navy's concern in Central Gulf Lease Offering April 1984, within Warning Area 155, 32 blocks were deferred from leasing and an additional 17 blocks were stipulated to allow no surface structures in exploration or development.

It is estimated that within subplanning areas C-2 and C-4 of the Central Gulf (Figure IV-1) there will be 154 exploration wells drilled, 9 platforms, and 80 miles of pipeline laid in C-2; and 10 exploration wells, 1 platform, and 10 miles of pipeline laid in C-4.

W-453 and W-155 cover all of subplanning area C-4; all projected activity for C-4 will occur in the joint usage areas. Since W-92 only occupies 12.6% of C-2, only 19 exploration wells and 1 platform are projected to be located in that warning area. It is unlikely that the one platform projected for each of subplanning areas C-4 and C-2, the seven exploration rigs in C-2, and the three exploration rigs in C-4 that are projected between 1988 and 1998 will impact any of DOD's activities in the warning areas. The greatest expected number of rigs per year to be located in either W-453 or W-92 will be only one in peak year 1991.

At a maximum as the result of this proposed sale, the military will have one service vessel and two helicopters per day to contend with in their missions into W-92, W-453, or W-155. These service vessels and helicopter flights can be monitored from the primary service base of Mobile, Alabama; Gulfport, Biloxi, and Pascagoula, Mississippi; and Venice, Louisiana, in W-453; and from the service bases of Venice, Leeville, Grand Isle, and Morgan City, Louisiana, in W-92.

Utilizing the above analysis of impacts with the understanding that the primary undesirable impact of oil and gas activities resulting from the Central Gulf of Mexico would be the restriction or reduction of military operations within the areas, see Table IV-43, Sale 104. Therefore, a total assessment of impacts for W-453 and W-92 would be low in each case, and high in W-155. However, in considering the Central Gulf warning areas as a whole, the impacts of oil and gas activities resulting from Sale 104 on military use will be low and high.

Table IV-43

Varying Degrees of Use and Impacts for Warning Areas

Warning Area	Operational Type and Frequency	Intensity of Operation	Projected Oil and Gas Activity	Total Impact Assessment
		Central Gul		
W-155	High	High	Moderate	High
W-453	Low	Low	Low	Low
W-92	Low	Low	Low	Low
		Western Gulf		
W-228	High	High	Moderate	High
W-602	Low	Low	Low	Low

In the Central Gulf of Mexico, approximately 708 lease blocks are affected by the military stipulation applied within designated warning areas. The stipulation and map showing the warning areas are discussed in Section II.A.l.c.(4). This stipulation has been applied to blocks in military warning areas in past lease sales in the Central Gulf. When exploratory drilling and related service vessel traffic and helicopter flights have occurred in a warning area, the military has been informed of all drilling activity, vessel trips, and air flights. The military had no problems to date with joint usage and has always recommended utilizing the stipulation on all leasing operations within their warning areas. As a result of applying the military stipulation to all oil and gas leases in the past, no joint usage conflicts have occurred, and the impact from oil and gas development has been very low.

The effect of the stipulation on the impacts of the proposed sale will be to reduce potential conflicts between military missions and service boat traffic and helicopter flights. The stipulation, where applied, requires the lessee/operator to notify the respective commander of each warning area of all activities scheduled within the area, including the placement of rigs and platforms, a notification prior to each service vessel and helicopter flight into the area, and an agreement by the lessee/operator to curtail all electromagnetic emissions while traveling through or into a warning area. The stipulation will have no effect on the location of exploration rigs and platforms or the number of vessels and helicopters, but it will mitigate the impact of an increasing amount of oil- and gas-related traffic.

Even though the impact of one potential conflict may be reduced, others will not be affected by the stipulation; therefore, the overall impact should remain as low and high.

Conclusion

The estimated level of impact resulting from the proposed action on military use of the warning areas is expected to be low for W-453 and W-92 and high for W-155.

Cumulative Impacts

Cumulative impacts will relate to oil and gas development associated with past lease sales, development as a result of the Central Gulf of Mexico Lease Sale 104, and present trans-Gulf vessel traffic and commercial and recreational fishing to and from Central Gulf ports.

The impacts from past oil and gas lease offerings have been very low. In W-453 there are currently active leases within which five wells have been drilled or permitted (four wells were dry). In W-92, 52 blocks have been leased; limited drilling has taken place. Impacts, thus far, have been nonexistent in W-92 and very low in W-453. Projections for Sales 67, 69, and 72, Central Gulf of Mexico Lease Offering (April 1984), Sale 98, and Sale 104 will result in eight rigs drilling at 23 locations in W-92 and eleven rigs drilling at 29 locations in W-453 and W-155 in peak years 1987-1991. The resultant service boat trips will increase by 70% from 1,100 in W-453 and by 64% from 800 in W-92.

The cumulative numbers of service vessel trips and helicopter flights have not increased sufficiently to present an interference with military operations nor will the number of exploration rigs and platforms restrict, curtail, or shift military missions within W-453 and W-92. However, the cumulative number of projected exploration rigs (2) in a year and platforms (4) may cause a curtailment of the Navy's carrier operations in W-155.

In addition to the impacts from oil and gas activities, ocean-going vessel traffic and commercial and recreational fishermen and boaters impact the military operations in the Central Gulf of Mexico.

In 1981, 268,340 vessels of all draft entered and exited ports in C-2 and C-4. Of this total approximately 20,000 vessels of draft greater than 18' traversed the deeper Gulf waters of C-2 and C-4. Only in C-4 would the vessel traffic close to shore affect military operations in W-453 and W-155. Warning Area 92 is affected by only the deepwater traffic traversing the Gulf. At present, the military has no operational control over vessel traffic into the warning areas, and in many cases no warning of when and where this traffic is crossing the warning areas. Commercial fishing vessels are covered in the above statistics of all vessel traffic; however, recreational fishing boats are not. Warning Area 92 is at too great a distance from shore to be affected by recreational fishing boats; however, W-453 and W-155 in extending in to shore have large numbers of recreational fishermen, sailboaters, and other recreational boaters passing into and through the warning areas. Due to the lack of oil and gas development in C-2 and C-4, the impact of other vessels and boats by sheer numbers is far greater than the impact projected from oil- and gas-related vessel traffic.

All air traffic is controlled by the FAA, and civilian air traffic into the warning areas is either curtailed, prohibited, or, in most cases, rerouted to avoid conflicts with military operations during their peak or intensive use periods.

Conclusion

The estimated levels of cumulative impacts on the warning areas is expected to be low for W-453 and W-92 and high for W-155.

(14) Impacts on Water Supply

Under normal OCS offshore and onshore support operations, varying quantities of water will be needed to assist in oil and gas exploration and development in the Gulf of Mexico. The quantities of water needed for each operation are varied and could place a strain on existing water supplies throughout the Gulf coastal states. The area impacted, duration of impact, recovery period, and other parameters are considered in assessing impacts from the proposed actions.

The following five impact levels will be used in the analysis of potential impacts on water supply:

Very High - Regional water supply substantially affected requiring facility construction, facility expansion, or a new source of water.

High - Water supply in several areas substantially affected requiring modifications of existing facilities.

Moderate - Water supply in one area noticeably affected stressing existing facilities.

Low - Minor stress on local water supply.

Very Low - No noticeable effect on water supply.

Increased demands on water resources are expected to occur as a result of elevated OCS support operations and related employment and population increases. Large quantities of freshwater, largely nonpotable, may be transported offshore and used on platforms during drilling activities and for mixing various drilling muds. Approximately 1.2 million gallons of water per well per year will be used in association with exploration and delineation well needs, along with 0.97 million gallons of water needed per developmental well per year, one-third of which is potable water (Blayney-Dyett, 1981; NERBC, 1976).

The addition of new gas processing plants to these areas could impact local water supplies. These plants incorporate a variety of cooling systems, some of which use large quantities of water. Once-through cooling systems use approximately 0.0015 gallons of water per cubic foot of gas processed, while recycling systems use little-to-no significant quantities of water, depending on the quality of the water used. The type of system and the volume of gas processed will constitute the quantities of water needed for such operations, with most plants using between 0-750,000 gallons/day and averaging approximately 200,000 gallons/day (NERBC, 1976).

Other activities associated with OCS support which may impact the area's water supply include: temporary support bases which supply up to 5.2 million gallons of freshwater/rig/year during drilling with 460,000 gallons being potable; permanent support bases which supply 8.2 million gallons of freshwater/platform/year during drilling with 460,000 gallons being potable (based on eight 15,000 wells per 2-rig platform/year); fabrication yards which produce 2-4 steel-fixed piling platforms per year and use as much as 1.24 million gallons/day when applying major steel rolling processes; concrete platform yards which require between 25,000-40,000 gallons/day; and petrochemical complexes which utilize up to 10 million gallons/day based on a primary complex consisting of a case ethylene plant, with hydrotreating and BTX-treating facilities (NERBC, 1976).

The question of whether there will be sufficient water to support future oil and gas operations in the Gulf of Mexico is addressed subsequent to the lease sales, at the time the required Exploratory Drilling Plans and Environmental Reports are submitted to MMS for review and approval. These plans and reports must describe proposed offshore and onshore operations and facilities and other requirements, including the estimated amount of water consumption. MMS will prepare an environmental assessment of the potential impacts of the proposed operations. An EIS will also be prepared if the environmental assessment indicates that approval of the plan would subsequently affect the human environment. Furthermore, states with approved CZM plans are required to make a determination that the proposed exploration plan is consistent with the CZM plan. This procedure should assure that State and local officials have the opportunity to review and approve, or disapprove, plan elements such as water use.

Impact Analysis

Increased demands on coastal water resources in the Central Gulf may be expected to occur as a result of increased OCS activities in this area. Changes in population and increased industrial activities may result in association with expanded OCS support activities resulting from the proposed sale. Based on those ratios developed previously, a schedule of operation for exploration/delineation wells being three months and developmental wells being two months, along with MMS estimates for the M Scenario of the Central Gulf, an estimated peak water consumption of 164.8 million gallons/year can be expected by 1997 (Table IV-44), which equates to 451,500 gallons/day. It is currently estimated that as many as two new service bases will be constructed as a result of the proposed action. These bases could use as much as 5.2-8.2 million gallons of freshwater/rig-platform/year with 460,000 gallons being potable. Projected peak (1987) new population growth associated with the proposed action is estimated to be minimal (1,081 persons) and distributed over 20 parishes and 6 counties, thus resulting in insignificant increases in local water usage and very low impacts as a result of population increases associated with the proposed action. Temporary, moderate impacts of a localized nature could be experienced, particularly in areas currently experiencing water supply shortages, as a result of increased water usage by onshore support operations and from the possible construction of (0-1) service base in coastal subarea C-4.

Conclusion

Any stress would only be of a temporary nature due to the availability of raw water in this region; therefore, the expected impacts are very low on regional water supplies.

Cumulative Impacts

In addition to those impacts discussed above, resulting from the proposed action, the addition of up to 13 new service bases, 2 platform fabrication yards, and 3 new gas processing plants, 140 platforms, 1,880 exploration/delineation wells, and 650 production wells will impact area water supplies as a result of prior OCS-related activities. These impacts to water supply will result in increased burdens on existing water resources. Mitigation of water supply-related impacts will require prudent site selection of these proposed onshore support facilities in areas known to possess ample surface and groundwater supplies at present, and with water resource conservation and development plans for the future.

Although Louisiana has one of the most abundant supplies of ground and surface water in the United States, recent studies conducted by the State point to a growing awareness that economic growth and human activities both above and below the ground are degrading the quality of its water resources. These factors, coupled with the natural processes of erosion, subsidence, and the predicted sea level rise currently threaten the future potential of these resources. In general, it was thought that the supplies of this area far exceeded the demands; however, as is the case with many of the coastal parishes, adequate water supplies do not always abound in those areas of need.

Many of the water supplies of the coastal communities near the fresh/saline interface are now and will continue to be affected by saltwater intrusion. Grand Isle, a barrier island resort community in southern Louisiana, is a prime example of this. This community is virtually isolated from any source of freshwater and at present imports some 500,000 gallons of freshwater per day from the Leeville, Louisiana, area some 12 miles west of Grand Isle. It is estimated that Grand Isle's water needs will double in the near future as a result of the increase in the area's population by summer recreationists. The demand on the water supply is so acute during the summer months that industries and visitors alike are rationed in their use of this precious commodity. Both surface and groundwater sources are either brackish or saline; therefore, the additional water needed will have to be obtained by importing water, desalinating water, or treating wastewater. Areas experiencing similar problems with saltwater intrusion consist of the City of Houma in Terrebonne Parish and all of the Plaquemines Parish area. These areas presently draw freshwater from two of the major sources of freshwater in the southern portion of the state; Houma from the Gulf Intracoastal Waterway and Plaquemines Parish from the Mississippi River. In both cases, the areas are in need of alternative sources of freshwater during periods of saltwater intrusion, some of which can persist up to 60 days in duration. In the Plaquemines Parish area,

Table IV-44

Cumulative Water Usage in Gulf of Mexico OCS Offshore Activities Associated with the Proposed Sales (million gallons water)

	Central Sale 104			Western Sale 105			Totals	
	EXP/DL	PL	DV	EXP/DL	PL	DV	Central	Western
1985	-	-	-	-	-	-	-	-
1986	-	-	-	-	-	-	-	-
1987	3.0	-	-	3.0	-	-	3.0	3.0
1988	6.0	8.2	0.4	6.0	8.2	0.4	14.6	14.6
1989	10.5	16.4	0.8	10.5	16.4	0.8	27.7	27.7
1990	21.0	32.8	1.6	18.0*	32.8	1.2	55.4	52.0
1991	24.0*	57.4	2.4	18.0	57.4	1.6	83.8	77.0
1992	15.0	82.0	2.4*	15.0	82.0	2.4*	99.4	99.4
1993	10.5	106.6	2.4	10.5	106.6	1.6	119.5	118.7
1994	7.5	123.0	1.6	6.0	123.0	1.6	132.1	130.6
1995	4.5	139.4	1.2	4.5	139.4	1.2	145.1	145.1
1996	4.5	147.6	0.8	3.0	147.6	0.8	152.9	151.4
1997	1.5	155.8	0.8	1.5	155.8	0.8	158.1	158.1
1998	-	164.0*	0.8	-	164.0*	0.8	164.8*	164.8*
1999	-	164.0	0.8	-	164.0	0.4	164.8	164.4
2000	-	164.0	-	-	164.0	-	164.0	164.0
2001	-	164.0	-	-	164.0	-	164.0	164.0
2002	-	164.0	-	-	164.0	-	164.0	164.0

*Denotes peak years

EXP/DL - Exploration Wells/Delineation Wells
PL - Platforms
DV - Development Wells

Based on M Scenario:

Exploration/Delineation Well - 1.2 million gallons/year
Developmental Well - 9.7 million gallons/year
Platform - 8.2 million gallons/year

Exp./Del. Well 3 mo's operation - 0.3 million gallons

Develop. Well 2 mo's operation - 0.08 million gallons the parish has responded to the problem by storing water in tanks, interconnecting downstream systems with more upstream systems, diluting brackish water with freshwater from storage, and promoting water conversion. Despite the efforts of the parish to combat the effects of this saltwater intrusion problem, the problem seems to be worsening as a result of elevated rates of land loss within the area.

In contrast to the saltwater intrusion problem, many of the areas of the State are faced with the potential problem that their water supplies can be or are being polluted by industrial discharges from both point and nonpoint sources. This is the case with the River Parishes, which consist of St. James, St. John the Baptist, St. Charles, Jefferson, Orleans, St. Bernard, and Plaquemines Parishes. The primary source of municipal and industrial freshwater for these parishes is the Mississippi River. In this heavily industrialized reach of the river, more than 1.5 million people use about 214 million gallons of river water per day. A chemical or oil spill from a river vessel, industrial plant, pipeline, etc., is a constant danger. In the last 10 years alone, some 2,616 spills into the Mississippi River have been recorded by the Coast Guard. In the event the river was polluted and not usable, water users would have to either import alternative supplies or use water previously stored. For a 15-day emergency period alone, the River Parishes would require some 200 million gallons per day.

OCS-generated new resident population would be distributed over 20 parishes and 6 counties, and could account for increased demands for residential water usage ranging from less than 0.05% to as high as 5%-7%.

Conclusion

Overall, these OCS-generated cumulative demands are expected to have a low impact on the water supply of the potentially affected area. However, the overall cumulative impact, which includes the effect of non-OCS population and industrial growth, is expected to be high.

(15) Impacts on Local Employment, Income, and Population

Section III.C.5. clearly addresses the economic importance of Federal OCS activity in the Gulf of Mexico to the coastal region, particularly Louisiana. In early 1983, MMS and the oil and gas industry were seriously concerned about the future of Federal OCS activity in relation to the energy inventory and outlook for the United States, as a whole, and the economies of adjacent coastal regions. This concern was founded in the harsh economic conditions which had occurred since 1981, as well as the significant drop in reserves discovered per year for Gulf of Mexico oil and gas activity in recent years. For a detailed discussion of these factors, see Sections III.C.6. and IV.D.2.a.(16) of Final EIS 94/98/102. Areawide Federal OCS lease sales help to maintain local employment, income, and population levels.

As expected, the Gulf of Mexico 1983 and 1984 areawide lease sales results were substantially greater than previous lease sales in the same areas. Also, significant improvements in coastal economies have occurred in both the Central and Western Gulf as a direct result of these two years of areawide sales. This level of leasing is not expected to continue, however. In future Gulf of Mexico OCS Federal lease sales, a gradual return to some lesser but stable level is anticipated.

Based on this expectation, MMS has analyzed the impacts of the proposed 1986 Federal lease sales in the Gulf of Mexico on local employment, payroll, and population in adjacent coastal regions. The following discussion centers on the direct and indirect impacts specifically associated with oil and gas industry activities. Admittedly, there would be other economic impacts, direct and indirect, associated with the proposed lease sales due to the affects on other industries, e.g., commercial or recreational fishing or tourism. The direct benefit or loss in such other areas is discussed in the sections of this EIS related specifically to those topics. The indirect effect on allied industries is much more difficult to address, except that it will agree generally with the type and magnitude of the direct impact. Also, the impacts on local community infrastructure, such as the demands for public services and facilities, are addressed in Sections IV.D.1.a.(16) and IV.D.2.a.(16).

The employment impact of proposed Federal OCS lease sales can be addressed in three distinct categories: direct, secondary, and induced.

Direct employment associated with the oil and gas extraction industry consist of those workers involved in oil and gas exploration activities and production operations, including geophysical/seismograph surveys, exploratory and development drilling, and well operation and maintenance. Contract field services, such as acidizing, cementing, mud service, well logging, perforations, etc., are also included. These activities are covered under the United States Government's Standard Industrial Classification (SIC) Code 13 - Oil and Gas Extraction. In estimating the amount of employment associated with projected SIC 13 activity from both past and future OCS lease sales, the following assumptions were used in the analysis for this EIS:

Exploration Activity - 1 rig can drill five wells per year with a crew of 133 workers.

Development Activity - 1 rig can drill six wells per year with a crew of 115 workers.

Platform Activity - 28 workers per platform.

Pipeline Activity - 1 lay barge can install 250 miles of pipeline per year with a crew of 300 workers.

Secondary oil- and gas-related industries include refining, oil field machinery and equipment manufacturing, pipeline transportation, gas production and distribution, and the wholesaling of petroleum and petroleum products. These activities are covered under SIC Codes 29, 3533, 46, 492, and 517. For the purpose of this analysis, further secondary employment due to the proposed OCS lease sales is estimated from multipliers of direct employment. Three multipliers are used based on the occurrence of production from the proposed lease sales under analysis. For years during the preproduction phase (i.e., exploratory drilling only), secondary employment for SIC Code 3533 is estimated as SIC Code 13 employment times 0.33. For years including both exploration and production activity, secondary employment for SIC Codes 29, 3533, 46, 492, and 517 is estimated as SIC Code 13 employment times 0.76. For years with production and no exploration activity, secondary employment for SIC Codes 29, 46, 492, and 517 is estimated as SIC Code 13 employment times 0.43. These multipliers are based on 1982 U.S. Department of Commerce data for these SIC categories of employment in the Gulf of Mexico coastal region.

In addition to these direct and secondary jobs, tertiary employment is also generated in the Gulf region. This includes jobs which are induced or supported by expenditures of direct and secondary employees. It results from the demand for consumer goods and services such as food, clothing, housing, entertainment, etc. These items are sought by all workers and households within a region, regardless of occupation. Based on MMS analysis for previous EIS's on proposed Federal OCS oil and gas lease sales, the multiplier used to estimate induced or tertiary employment for the proposed lease sales is 0.33 times direct plus secondary employment.

In analyzing the impact of the proposed lease sale-related employment (direct, secondary, and tertiary), MMS has also estimated Federal OCS activity and employment for future years under the assumption of no additional lease sales in the Gulf of Mexico after 1985. Thus, the relative importance of the increase in employment due to the proposed 1986 lease sales can be clearly identified. Furthermore, the amount of employment which will attract new residents into the Gulf region is estimated as peak future oil and gas employment with the proposed lease sales minus peak future oil and gas employment without the proposed lease sales, regardless of differing years of peak impact for each condition.

Total new resident population is estimated as the number of employees who move into the region times 2.3, which is the 1982 population/employment ratio for the entire Gulf of Mexico coastal region. Payroll relative to new resident direct, secondary, and tertiary employment generated by the proposed lease sales is estimated as new resident employment multiplied by the comparable average payroll per employee (Section III.C.6.). The average payroll figures applied to direct and secondary employment are based on 1982 U.S. Department of Commerce payroll data for the applicable SIC categories included in the direct and secondary oil- and gas-related industries. Average payroll per employee for tertiary employment is based on the 1982 data for all SIC categories. The impacts on employment, payroll, and population will be measured by the anticipated influx of new employees and residents into the Gulf region as a result of the proposed lease sales. The following impact measures are used as a basis for analysis conclusions relating to specified impact producing conditions:

Very High - 10% or greater annual growth in employment/payroll/population.

High - 7%-9% annual growth in employment/payroll/population.

Moderate - 4%-6% annual growth in employment/payroll/population.

Low - 2%-3% annual growth in employment/payroll/population.

Very Low - 1% or less annual growth in employment/payroll/population.

This analysis implicitly assumes that the net increase in employment created by the proposed lease sales will go to employees currently outside the region. Instead, these opportunities may be used by workers currently in the coastal region who are unemployed, not in the labor force, or employed within non-oil and gas activity. These occurrences were not quantified due to lack of detailed base information.

Also, activity in each Federal OCS planning area will result in non-payroll expenditures on equipment requirements. A portion of these expenditures will benefit the economy of the coastal region to the extent that these equipment requirements are manufactured or supplied locally.

Impact Analysis

Direct employment levels (SIC 13) in the CPA are shown in Figure IV-5. Historical data are presented for 1980-1982, and employment with and without the proposed lease sale is projected to 2006. These data are for the coastal parishes/counties identified in Section III.C. Employment projections with the proposed CPA lease sale are based on the well drilling, platform, and pipeline requirements estimated under the M Scenario. Employment projections are also made on the basis of no future CPA sales after 1985 for the purpose of comparative analysis.

As shown in Figure IV-5, Central Gulf SIC 13 employment increased over the 1980-1982 period. However, in 1983, a decrease is estimated to have occurred, based on MMS data on mobil rig activity for the Gulf OCS. Furthermore, this decline is estimated to have been halted in 1984 by employment growth resultant from increased drilling activity associated with the 1983 and 1984 Gulf OCS areawide lease sales. It is the conclusion of MMS that these sales have partially restored coastal oil and gas dependent economies that were nearly devastated in late 1982 and much of 1983. Furthermore, employment opportunities expected from 1983, 1984, and 1985 Central Gulf areawide lease sales (Sales 72, 81, and 98) are expected to continue to improve Central Gulf coastal economic conditions until 1987. Thereafter, a gradual decline in employment is expected. Both the growth and decline in direct oil and gas employment associated with past Gulf lease sales prior to 1986 are illustrated in Figure IV-5.

The direct effect of proposed Sale 104 on Central Gulf coastal economies is illustrated by the shaded area in Figure IV-5. While MMS analysis has shown that both of the proposed 1986 lease sales will affect the Central Gulf coastal region, about 91% of the Central Gulf employment from those sales will be from proposed Sale 104. Table IV-45 enumerates this direct effect, as well as related secondary and induced effects, by affected coastal subareas. Proposed Sale 104 is expected to provide employment to Central Gulf residents throughout the 1987-2006 period. Employment generated from the proposed action is expected to peak in 1991 at 7,491 jobs. While the total and peak year level of job opportunities expected to be created by the proposed action are noteworthy, a more important parameter is the expected amount of jobs generated from the

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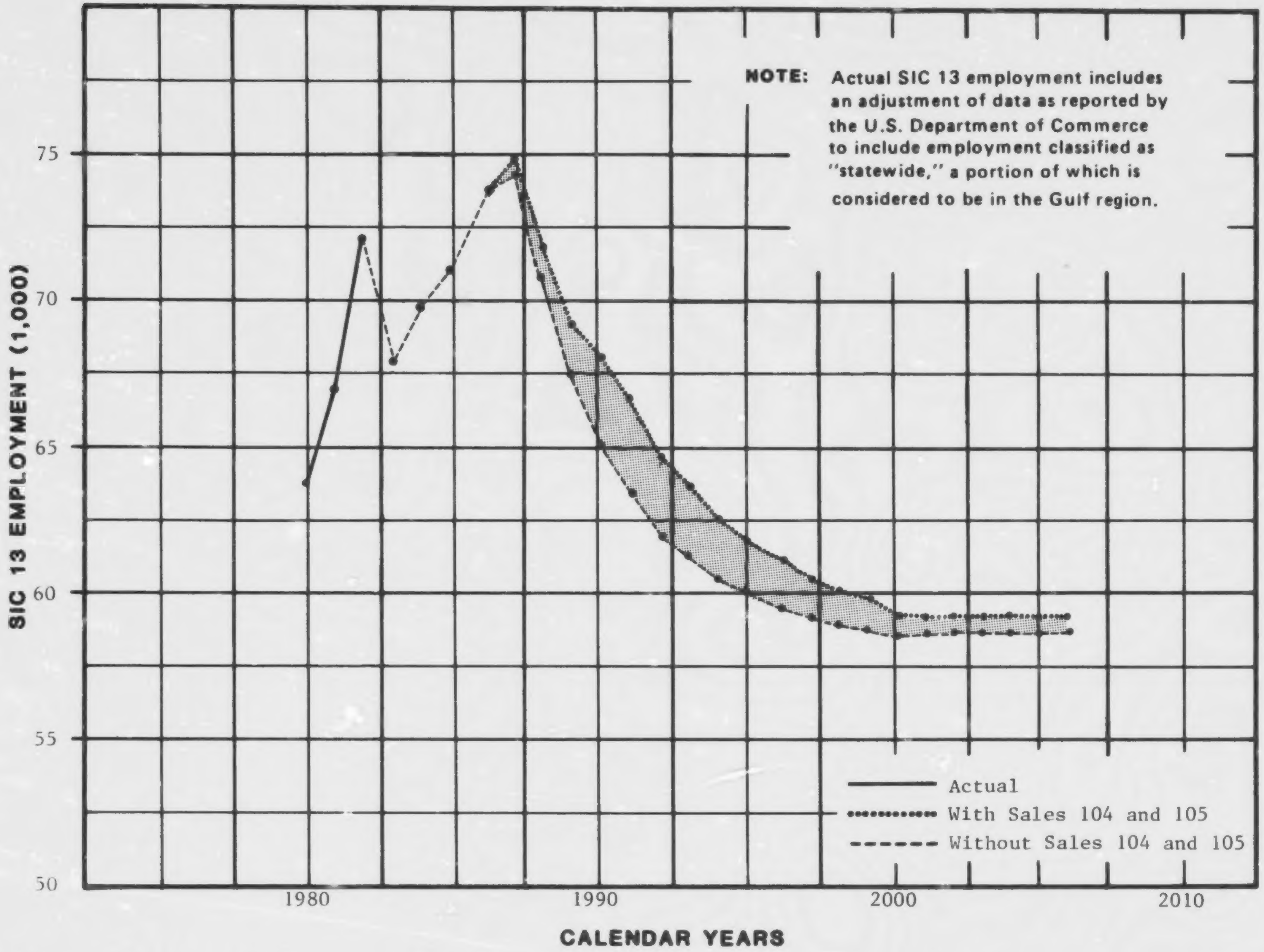


Figure IV-5. Direct Oil and Gas Employment in the Central Region (Onshore and Offshore, Find Scenario.

Table IV-45

Sale 104 - Related Employment Projections by Affected Coastal Subareas
(Most Likely Find Scenario)

Year	Coastal Subarea C-1				Coastal Subarea C-2				Coastal Subarea C-3			
	Direct	Secondary	Induced	Total	Direct	Secondary	Induced	Total	Direct	Secondary	Induced	Total
1987	72	40	37	149	114	17	43	174	72	17	29	118
1988	263	261	173	697	419	233	215	867	263	136	132	531
1989	410	406	269	1085	652	362	335	1349	410	212	205	827
1990	738	733	485	1956	1176	653	604	2433	738	383	370	1491
1991	864	857	568	2289	1376	765	707	2848	864	449	433	1746
1992	671	666	441	1778	1069	594	549	2212	671	348	336	1355
1993	586	581	385	1552	933	519	479	1931	586	304	294	1184
1994	498	494	327	1319	793	441	407	1641	498	259	250	1007
1995	410	408	270	1088	654	363	336	1353	410	213	206	829
1996	402	399	264	1065	640	355	328	1323	402	208	201	811
1997	323	320	212	855	513	286	264	1063	323	168	162	653
1998	294	127	139	560	469	192	218	879	294	84	125	503
1999	294	127	139	560	469	192	218	879	294	84	125	503
2000	151	65	71	287	241	99	112	452	151	43	64	258
2001	151	65	71	287	241	99	112	452	151	43	64	258
2002	151	65	71	287	241	99	112	452	151	43	64	258
2003	151	65	71	287	241	99	112	452	151	43	64	258
2004	151	65	71	287	241	99	112	452	151	43	64	258
2005	151	65	71	287	241	99	112	452	151	43	64	258
2006	151	65	71	287	241	99	112	452	151	43	64	258

Year	Coastal Subarea C-4				Total			
	Direct	Secondary	Induced	Total	Direct	Secondary	Induced	Total
1987	8	14	7	29	266	88	116	470
1988	30	111	47	188	975	741	567	2283
1989	45	171	71	287	1517	1151	880	3548
1990	82	309	129	520	2734	2078	1588	6400
1991	95	362	151	608	3199	2433	1859	7491
1992	74	281	117	472	2485	1869	1443	5817
1993	65	246	103	414	2170	1650	1261	5081
1994	56	208	87	351	1845	1402	1071	4318
1995	46	172	72	290	1520	1156	884	3560
1996	45	169	71	285	1489	1131	864	3484
1997	36	135	56	227	1195	909	694	2798
1998	33	66	33	132	1090	469	515	2074
1999	33	66	33	132	1090	469	515	2074
2000	17	34	17	68	560	241	264	1065
2001	17	34	17	68	560	241	264	1065
2002	17	34	17	68	560	241	264	1065
2003	17	34	17	68	560	241	264	1065
2004	17	34	17	68	560	241	264	1065
2005	17	34	17	68	560	241	264	1065
2006	17	34	17	68	560	241	264	1065

proposed action which attract new residents into the region, which is shown in Table IV-46. MMS analysis indicates that new residents to the Central Gulf region due to proposed Sale 104 will be small in number (1,081 people) and will occur only in 1987, the first year of generated employment by the proposed action. Generally, 1987 is the cumulative peak in employment in the Central Gulf coastal region, primarily due to Gulf of Mexico OCS areawide lease sales prior to 1986. The proposed action is expected to add a slight amount of employment to that peak year activity. Subsequent to 1987, the proposed action will allow a continuation of some existing oil- and gas-related jobs in the CPA.

Table IV-46

Sale 104 - Related New Resident Projections

Coastal Subareas	Year of Peak Impact	New Resident Projections		
		Employment	Payroll	Population
		Low, Most Likely, and Total Scenarios		
C-1	1987	149	$ 3,561,100	343
C-2	1987	174	$ 4,158,600	400
C-3	1987	118	$ 2,820,200	271
C-4	1987	29	$ 693,100	67
Total	1987	470	$11,233,000	1,081
		High Scenario		
C-1	1987	898	$21,462,200	2,065
C-2	1987	833	$19,908,700	1,916
C-3	1987	600	$14,340,000	1,380
C-4	1987	221	$ 5,281,900	508
Total	1987	2,552	$60,992,800	5,869

Personal income associated with this increased employment will average $23,900 (1982 dollars) per employee as compared to an average payroll per employee for all workers in the CPA in 1982 of $15,904.

Under the M Scenario, well drilling, platform fabrication, and other equipment expenditures resulting from the proposed sale are expected to total $4.6 billion throughout the life of sale-related exploration and development activity. A major portion of these expenditures are expected to remain in the coastal region.

Conclusion

Based on the level of peak year new resident activity, which occurs in 1987, the impact of the proposed action in all Central Gulf coastal subareas is expected to be very low.

Cumulative Impacts

The cumulative impact analysis for the CPA is based on the expectations of the proposed actions in the Gulf of Mexico, as well as the projected effects of past leasing and other existing employment producing activities (in all industries). Total population, employment, and income in the Central Gulf coastal region is addressed in Section III.C. of this EIS.

These aggregate indicators of economic activity have been projected by MMS on the basis of growth trends for standard metropolitan statistical areas (SMSA's) and other substate regions prepared by the U.S. Department of Commerce (USDC). These growth trends were derived for use in the published report, 1980 BEA Regional Projections, which was developed under the supervision of USDC's Bureau of Economic Analysis. Since this analysis was based on historical data through 1978 only, MMS continually analyzes these projections in light of more recent information. The projections used for this EIS reflect a consideration of historic data through 1982. Total employment, income, and population in the Central Gulf coastal region based on this analysis is expected to grow throughout the next 10 years at an average rate of 1% annually even without additional OCS oil and gas lease sales. The proposed action will have a negligible effect on this total average annual growth rate on the basis of less than 1% growths in economic activity in each affected coastal subarea, as previously discussed in this report.

Conclusion

The proposed action will have a negligible effect on the annual growth rate of total employment, income, and population in the Central Gulf coastal region. The cumulative effect will be an average annual growth rate of about 1%, which is considered a low impact level.

(16) Impacts on Community Infrastructure

Community infrastructure, as used in this analysis, includes commonly provided public, semipublic, and private services and facilities, such as education, police and fire protection, sewage treatment, solid waste disposal, water supply, recreation, transportation, health care, other utilities, and housing. During the scoping process, concerns were raised about the potential adverse effects of OCS-related activity on the quality of community infrastructure: that new or expanded activity in certain locations could result in significant increases in the demand and usage of community infrastructure; and that serious adverse effects could arise if the amount or rate of increase in the usage significantly exceeded the capability of a local area to provide a satisfactory level of service.

The development scenario for the proposed action (M Scenario) described in Section IV.A.1. postulates that offshore exploration, development and production activities, and onshore support services and processing activities will increase employment opportunities and generate new resident population in the Gulf coastal region.

Population growth is considered the major impact producing factor for community infrastructure because it increases the demand for, and use of, community services and facilities listed above. Such increases could cause reductions in the quality of service and other adverse effects (e.g., fewer, less frequent services; crowding or congestion of facilities; shortages in supply; reductions in service standards; and fiscal balance problems).

Increases in local and regional business activity, population, property values, income, and housing generated by the proposed sales will cause public revenues to increase. At the same time, expenditures for public services and facilities will rise in response to increased demands engendered by OCS-related economic activity and population growth. While revenues generated by OCS onshore activities are estimated to be sufficient over the long-run to cover expenditures, there could be a lag between the time those service needs arise (the beginning of onshore impacts) and the time at which taxes imposed on new onshore activities/facilities begin to produce significant revenue. The gap by which revenues lag behind increased service demands may cause problems for some communities. There may also be imbalances between the communities in which the

OCS-generated industrial activities/facilities are located and the communities in which the new residents reside, if different. In addition, the temporary nature of the peak demands could create special scheduling and financing problems.

The ultimate impact of OCS-generated activities, development, new population, and increased service demands will be significantly affected by the planning and other mitigation measures undertaken at the Federal, State, regional, and local levels. All of the potential onshore development areas either have or participate in local and/or regional planning programs; in addition, the entire coastal region is included within state coastal management programs. The objectives of these programs include orderly and efficient growth management that minimizes fiscal, social, and environmental impacts. This impact analysis assumes that Federal, State, and local management efforts will be effective in avoiding or mitigating many potential adverse effects on the quality of community infrastructure that might otherwise occur as a result of OCS development.

In the following analyses, OCS-generated population growth is used as an overall indicator of impacts on various community services and facilities since these impacts are proportional to the population increase. Table IV-47 shows the typical increase in demand/use of various community services and facilities per 100 additional residents (users).

Table IV-47

Typical Impact of Population Growth
on Community Services and Facilities

Service/Facility	Typical Amount Generated by 100 Additional Residents
Educational Enrollment	21 students
Police and Fire Protection	0.30-0.45 personnel
Housing	33 units
Water	10,000-18,000 gals/day
Sewage	10,000-20,000 gals/day
Solid Waste	600 lbs/day
Transportation	220-500 auto trips/day

Source: USDI, Minerals Management Service, Gulf of Mexico OCS Region.

The county (parish in Louisiana) is the basic geographic unit used in this analysis. The specific counties included in the analyses are those estimated likely to experience potential OCS-generated population growth and related impacts on community infrastructure.

The amount of growth provides a measure of the total increase in demand for and use of community services and facilities (i.e., total impact). However, the potential severity of impacts is judged to be proportional to the population growth rate, i.e., the rate at which demand/use increases. Therefore, for this analysis, the average annual percentage increase (growth rate) in the population of a potentially affected area caused by the OCS-generated and the baseline population growth will be used as general indicators of the potential severity of the impacts. Population growth rates in excess of 10% per year have been shown to create a significant strain on a community's ability to provide adequate services and facilities (ASPO, 1977). Using a 10% annual growth to define the high level impacts, the following five impact levels were formulated for use in this analysis:

Very High - Potentially major long-term adverse effects on community services and facilities: indicated by a 10% or more average annual growth rate in the population of the potentially affected area.

High	- Potentially significant adverse effects on community services and facilities: indicated by a 3%-9.9% average annual growth rate in the population of the potentially affected area.
Moderate	- Potentially moderate adverse effects on community services and facilities: indicated by a 1.5%-2.9% average annual growth rate in the population of the potentially affected area.
Low	- Minor adverse effects on community services and facilities: indicated by a 0.5%-1.4% average annual growth rate in the population of the potentially affected area.
Very Low	- Negligible to minor adverse effects on community services and facilities: indicated by a less than 0.5% average annual growth rate in the population of the potentially affected area.

Impact Analysis

Table IV-48 includes the total estimated OCS-generated population growth (peak year) and related data for potentially affected coastal subareas and parishes/counties resulting from the proposed action (M Scenario estimates).

A total OCS-generated population growth of 1,100 persons is estimated as a result of the proposed action. This growth would occur over the period from the sale in April 1986 through 1987, with a distribution by coastal subarea and potentially affected parishes/counties as shown in Table IV-48.

Coastal subarea C-1 is estimated to experience an OCS-generated population growth of 300 persons, representing an average annual growth rate of less than 0.05%. OCS-generated population increases range from less than 50 persons in Cameron Parish to 100 persons in Calcasieu, Iberia, and Lafayette Parishes. However, the average annual growth rate in each parish is 0.1% or less, indicating that a very low level of expected impact (negligible to minor adverse effects) on community infrastructure.

Coastal subarea C-2 is estimated to experience impacts similar to those of coastal subarea C-1. Total OCS-generated population growth is estimated at 400 persons, representing an average annual growth rate of less than 0.05%. The average annual growth rates expected in the affected parishes are all extremely low, ranging from less than 0.05% in eight parishes to 0.1% in Ascension and St. Mary Parishes, indicating a very low level of expected impact on local community infrastructure.

Coastal subarea C-3 is also estimated to experience impacts similar to those of coastal subareas C-1 and C-2. The average annual growth rate in each of the five potentially affected parishes is less than 0.05%, indicating a very low level of expected impact on local community services and facilities.

An OCS-generated population growth of only 100 persons is estimated for coastal subarea C-4, representing an average annual growth rate of less than 0.05%. Each of the four potentially affected parishes in this subarea is expected to experience similarly low total and average annual growth rates in OCS-generated population, indicating a very low expected impact on local community infrastructure.

In summary, the total OCS-generated population growth resulting from Sale 104 is estimated at 1,100 persons. These new residents will result in increased demands for, and use of, commonly provided public, semipublic, and private services and facilities (Table IV-47 lists the effects of population growth on community services and facilities) which could have adverse effects. The analysis estimates that the new residents would be distributed among 26 potentially affected counties as indicated in Table IV-48. Over 70% of these new residents are estimated to be located in eight Louisiana parishes; however, none of these parishes is estimated to experience an average

Table IV-48

Community Infrastructure Impact Indicators: Sale 104 (Central Planning Area)

Coastal Subarea/ County/State	Estimated Population 1986 (1000)	Proposed Action (M and L Scenarios) OCS-Generated Population		Baseline Population Change	Cumulative Population Change[4]	T Scenario OCS-Generated Population[5]		H Scenario OCS-Generated Population	
		Total[1] Increase (1000)	Average[2] Annual Increase (%)	Average[3] Annual Increase (%)	Average Annual Increase (%)	Total[1] Increase (1000)	Average[2] Annual Increase (%)	Total[1] Increase (1000)	Average[2] Annual Increase (%)
Coastal Subarea C-1	477.4	0.3	**	1.5	1.5	0.3	**	2.1	*
Calcasieu, LA	179.8	0.1	**	1.2	1.3	0.1	**	0.7	*
Cameron, LA	9.5	*	0.1	0.2	0.2	*	**	*	*
Iberia, LA	68.0	0.1	**	1.0	1.1	*	**	0.3	*
Lafayette, LA	168.4	0.1	**	1.9	1.9	0.1	**	0.8	*
Vermilion, LA	51.2	*	**	1.2	1.2	*	**	0.2	*
Coastal Subarea C-2	899.0	0.4	**	1.5	1.5	0.4	**	1.9	*
Ascension, LA	54.7	0.1	0.1	1.5	1.6	0.1	**	0.3	*
East Baton Rouge, LA	400.6	0.1	**	1.5	1.5	0.1	**	0.4	*
Lafourche, LA	89.9	*	**	1.5	1.5	*	**	0.2	*
Livingston, LA	64.3	*	**	1.6	1.6	*	**	0.1	*
St. Charles, LA	40.6	*	**	1.3	1.3	*	**	0.1	*
St. James, LA	23.4	*	**	1.3	1.3	*	**	0.1	*
St. John the Baptist, LA	34.8	*	**	1.5	1.5	*	**	0.1	*
St. Mary, LA	68.6	0.1	0.1	1.0	1.1	0.1	**	0.3	*
Terrebonne, LA	102.9	*	**	1.5	1.5	*	**	0.2	*
West Baton Rouge, LA	21.0	*	**	1.4	1.4	*	**	0.1	*
Coastal Subarea C-3	1,267.4	0.3	**	0.7	0.7	0.3	**	1.4	*
Jefferson, LA	474.6	0.1	**	0.7	0.7	0.1	**	0.6	*
Orleans, LA	582.3	0.1	**	0.7	0.7	0.1	**	0.7	*
Plaquemines, LA	28.3	*	**	1.4	1.4	*	**	*	*
St. Bernard, LA	66.9	*	**	0.3	0.3	*	**	*	*
St. Tammany, LA	115.3	*	**	0.7	0.7	*	**	0.1	*
Coastal Subarea C-4	804.3	0.1	**	1.1	1.1	0.1	**	0.5	*
Hancock, MS	25.7	*	**	0.8	0.8	*	**	*	*
Harrison, MS	165.0	*	**	0.7	0.7	*	**	0.1	*
Jackson, MS	135.7	*	**	2.3	2.3	*	**	*	*
Stone, MS	10.2	*	**	1.0	1.0	*	**	*	*
Baldwin, AL	82.8	*	**	0.9	0.9	*	**	*	*
Mobile, AL	384.9	*	**	0.9	0.9	*	**	0.2	*
Total	3,449.9	1.1	**	1.1	1.2	1.1	**	5.9	*

*Denotes an increase of less than 50 persons.

**Denotes an increase of less than 0.05%.

[1] The maximum or peak year levels of OCS-generated new resident population.
[2] The average annual increase in OCS-generated population expressed as a percentage of the baseline population in the beginning year.
[3] The projected average annual percentage increase in the baseline population.
[4] Proposed action plus baseline population change.
[5] Effects of T Scenario are analyzed in Section IV.D.1.e.(16).

Note: Impact levels are based on average annual growth rates as follows: less than 0.5% (very low); 0.5%-1.4% (low); 1.5%-2.9% (moderate); 3%-9.9% (high); and greater than 10% (very high)

Source: USDI, Mienrals Management Service, Gulf of Mexico OCS Region estimates.

annual increase of more than 100 persons or an average annual population growth rate of more than 0.1%. This indicates that negligible to minor adverse effects on communities services and facilities are likely to occur as a result of the proposed action.

Conclusion

The analysis finds that the expected level of impact on community infrastructure will be very low.

Cumulative Impacts

The indicators of potential cumulative impacts are the combined peak rates of population growth generated by the proposed action plus the baseline population growth (which includes the effects of prior OCS sales). As shown in Table IV-48, these combined rates (average annual percentage increases) are significantly greater than the growth rates associated with the proposed action alone. This reflects the baseline population growth which accounts for 83% to over 99% of the combined rates. The baseline population growth is estimated to continue over the entire period of exploration, development, and production associated with the proposed sale, but at a somewhat lower growth rate after 1990. The cumulative growth rates range from 0.2%-2.3% per year among the 26 potentially affected counties.

Conclusion

The analysis indicates that the expected peak level of cumulative impacts on community infrastructure would be very low (less than 0.5% growth rate) for 2 parishes/counties, low (0.5%-1.4%) for 16 parishes/counties, and moderate (1.5%-2.9%) for 8 parishes/counties (Table IV-48). Most (6) of the areas that would have moderate impacts are in coastal subarea C-2.

(17) Impacts on State and Local Land Use Management

This analysis is concerned with the degree to which the proposed action, if implemented, would conflict with approved CZM and local land use management programs in the affected states and whether necessary offshore and onshore support activities/facilities resulting from the sale can be designed, constructed, and operated in a manner compatible with the relevant objectives and implementing provisions of these programs. It is noted that the following discussion and analyses should not be construed as a determination of the proposed action's consistency with any state's CZM program, but rather as an analysis in compliance with NEPA regulations (40 CFR 1502.16(c) and 1506.2(4)(d)).

The States of Alabama, Mississippi, and Louisiana have Federally approved coastal zone management programs. The State of Texas manages coastal development independent of the Federal CZM program. Regional planning organizations, made up of a number of counties/parishes and cities, exist in the coastal areas of each state. These planning organizations generally conform to State coastal management policies and expand these policies into plans and implementation recommendations. A state by state general description of CZM policies and a listing of the affected regional planning organizations is included in Section III.C.4.

The estimated amounts and general locations of offshore and onshore activities and facilities likely to result from the proposed sale are identified in the development scenario described in Section IV.A.1. (M Scenario). This scenario represents a hypothetical framework of assumptions and estimates of the amounts and general locations of exploration, development, and production activities/facilities considered suitable for presale analysis of potential impacts. The scenario is not intended as a development plan; it does not represent recommendations or commitments to particular locations or even types of facilities.

It is noted that if the proposed sales are held, all subsequent proposals by operators to undertake exploration, development, and production activities must go through necessary Federal, State, and local review and permitting processes to ensure that suitable procedures and sites are used and potential adverse impacts are mitigated. Historically, in the Gulf region offshore operators have been able to accommodate the concerns of the states with approved CZM programs in regard to the consistency requirements for exploration, development, and production proposals and other Federally permitted activities. States and operators have agreed to terms and conditions not initially deemed necessary or appropriate in order to address a site-specific problem. This demonstrates that the administrative framework has the flexibility to allow the reconciliation of site-specific questions which emerge after the lease sales.

At the presale stage when there are no site-specific proposals of operators to review, analysis of potential impacts (conflicts or incompatibilities) must be based on the hypothetical development scenarios and reasonable estimates of the degree to which OCS offshore and onshore activities and facilities can be designed, located, constructed, and operated in a manner consistent with State and local policies, plans, and regulations.

The following five levels of impact are used in the analyses and conclusions that are subsequently discussed:

Very High - OCS offshore and onshore activities/facilities cannot be designed, located, constructed, and operated in any manner that would not result in a significant conflict with CZM policies and implementing provisions, land use plans, and development regulations. Facility not permitted and/or CZM consistency denied. Federal mediation procedures necessary.

High - OCS offshore and onshore activities/facilities cannot be designed, located, constructed, and operated in a manner that would entirely avoid or mitigate major adverse impacts on CZM policies and implementing provisions, land use plans, and development regulations. Facility not permitted and/or CZM consistency denied. Federal mediation procedures necessary.

Moderate - OCS offshore and onshore activities/facilities can be designed, located, constructed, and operated in a generally compatible but less than ideal manner, i.e., moderate incompatibilities and potential adverse impacts with respect to one or more CZM policies and implementing provisions, land use plans, and development regulations would be likely. Many additional mitigation measures and/or project changes would be necessary to resolve conflict and gain approval.

Low - OCS offshore and onshore activities/facilities can be designed, located, constructed, and operated in a manner that is compatible, but not without some potential minor adverse impacts to one or more CZM policies and implementing provisions, land use plans, and development regulations. A few additional mitigation measures and/or minor project changes would be necessary for approval.

Very Low - OCS offshore and onshore activities/facilities can be designed, located, constructed, and operated with negligible to minor incompatibilities or potential adverse impacts to CZM policies and implementing provisions, land use plans, and development regulations. Very few additional mitigation measures and/or minor project changes would be necessary for approval.

Table IV-49 indicates the amount of land generally used for new onshore support and processing facilities, including service bases, pipe coating yards, pipelines, marine terminals, platform fabrication yards, and gas processing plants. It is noted that these facilities are impact producing factors or agents with respect to a number of other environmental and socioeconomic resources of concern. The impacts on these concerns (e.g., sensitive coastal habitats, endangered and threatened species, commercial fishing, designated environmental preservation areas, tourism activity/industry, and water supply) are discussed elsewhere in Section IV.D.

Table IV-49

New Facility Acreages

Facility Type	Acres
Service Base	
Exploration	6-14
Development/Production	35-75
Pipeline Installation	5
Pipe Coating Yard	100-150
Pipeline Landfall (with pumping station)	40
Onshore Pipeline (per mile)	3-12
Marine Terminal	30
Platform Fabrication Yard	200-400
Gas Processing Plant	50-75

Source: USDI, Minerals Management Service, Gulf of Mexico OCS Region estimates.

A short description of the major characteristics of service bases, pipe coating yards, platform fabrication yards, and gas processing plants follows:

- Service Bases: The three kinds of bases considered were the temporary (used during the exploratory drilling phase), the permanent (used during the production phase), and the pipeline installation base. A temporary base requires limited acreage for the short-term, depending on the number and size of vessels and rigs it services. The bases are essentially port facilities which require dockside space, warehousing, open air storage, and a small amount of office space. If buildings are not available, trailers can be brought in. The amount of land and marginal wharf required for temporary service bases could be provided by existing facilities without causing significant conflicts or competiton with other port and harbor activities in the potential onshore development areas. A permanent base provides essentially the same services as a temporary base, but its utilization of land is correlated to the amount of production activity occurring. Long-term usage as operations bases is considerably greater than temporary bases and may result in full utilization of dockside land in some ports and may require the development of additional land and marginal wharfs in other ports. Pipeline installation bases are usually of a short-term basis and also require a waterfront location.

- Pipe Coating Yard: These yards are used to prepare steel pipe for underwater adaptation through the application of concrete and asphalt sealers to protect it and permit it to sink to the seabottom. The facility is generally large and requires between 100-150 acres with a working area and rows of stacked pipe. Usually, a section is set aside for multiple yard uses since pipelaying is of a seasonal nature with a short demand period. For limited operations, a portable or "railhead" pipe coating operation may be established. Most existing pipe coating yards are located with other oil and gas industry related oeprations, particularly a pipeline installation base. Other factors influencing a siting decision include distance between find and the existing competition, capacity of existing yards to meet demands during offshore oeprations, access to pipe and raw materials, and expected quantity of work.

- Platform Fabrication Yard: In the Gulf of Mexico, steel rather than concrete platforms are almost entirely utilized because of Gulf geologic conditions. Permanent steel platform fabrication yards are large waterfront facilities on 200-400 acres of cleared land with administrative and workshop buildings. They are built in response to the size of a significant find and determination of annual platform needs. A yard may be located at a far distance from the development area and platforms are then towed long distances to service several adjacent areas. An option to construction of a large yard is manufacturing deck modules and jackets at a smaller local yard, and manufacturing the steel components at a distant central yard.

- Gas Processing Plant: These plants are required to treat and process natural gas by separating methane from the higher molecular weight compounds that are associated with natural gas. After separation the gas goes through additional treatment and is then transshipped to gas transmission pipelines. Plants are usually constructed along pipeline routes between landfalls and existing transmission lines. Approximately 50-75 acres are necessary for a new facility. The size depends on the size of the field and the amount of gas stream to be processed.

Impact Analysis

The estimated number of major new onshore facilities (including their potential locations) used in support of offshore development under the M Scenario for Sale 104 is discussed in Section IV.A.1.e.

Onshore support and processing services for offshore drilling and production under the M Scenario for Sale 104 are estimated to be provided almost entirely from existing facilities in Louisiana, Mississippi, Alabama, and Texas. The Central and Western coastal areas have a highly developed system of onshore support and processing infrastructure serving oil and gas development on the OCS, as well as in State offshore waters, wetlands, and upland areas. Much of this infrastructure currently has unused or readily expandable capacity.

New facilities estimated under the M Scenario include possibly one (0-1) service base supporting development/production from coastal subarea C-4 and up to three (0-3) pipeline landfalls (possibly one each in coastal subareas C-1, C-2, and C-3) with up to 60 miles of onshore routing. Likely potential locations for the service base are the existing port/industrial areas located in the Long Beach-Biloxi area (Harrison County, Mississippi), Pascagoula area (Jackson County, Mississippi), and the Mobile-Bayou LaBatre area (Mobile County, Alabama). Likely potential locations for the pipeline landfalls and onshore routes include Cameron, Vermilion, Iberia, St. Mary, Terrebonne, Lafourche, Jefferson, Plaquemines, and St. Bernard Parishes in Louisiana (not more than one pipeline landfall is assumed for any of these parishes).

Provisions of the Louisiana Coastal Resources Program (LCRP) which could affect OCS-related activities/facilities include coastal use guidelines (criteria used for granting or denying coastal use permits) which: list the categories of adverse effects which should be avoided to the maximum extent practicable; apply to the location and operation of waste disposal facilities; apply to oil and gas activities requiring that exploration and production facilities be designed and constructed using best practical techniques to minimize adverse environmental impacts; regulate the discharges of polluting substances into surface waters; apply to permitting of siting and installation of pipelines affecting the coastal area and requiring avoidance of adverse effects to certain biological resources and use of best techniques to minimize disruption of natural hydrologic and sediment transport patterns and water quality; apply to the disposal of dredge spoil; and apply to surface alterations.

Applicable provisions of the Mississippi Coastal Program (MCP) which could affect OCS-related activities/facilities include the following elements (requiring permits and compliance with adopted State regulations) which apply to: the preservation of coastal wetlands and to the prevention of their despoliation and destruction; providing for reasonable industrial expansion in the coastal area and to insuring the efficient utilization of waterfront industrialization so that suitable sites are conserved for water dependent industry; the protection, maintenance, and improvement of air and water quality; the use of coastal water resources; preserving and protecting historical and archaeological resources; encouraging preservation of natural scenic qualities; and fisheries management.

Provisions of the Alabama Coastal Area Management Program (ACAMP) which could affect OCS-related activities facilities include policies, rules, and regulations applying to: the encouragement and support of the development of the economic resources of the coastal area including the port, industrial, energy, recreational, and mineral resources in a manner consistent with natural resources and water quality policies; commercial fisheries management; shoreline erosion control; the maintenance, enhancement, and monitoring of biological productivity; the maintenance, enhancement, and restoration of water quality; the management of water resources; the maintenance, restoration, and enhancement of beach and dune systems for erosion control, wildlife habitat, and recreational opportunities; the maintenance and protection of wildlife habitats including preservation of the critical habitat of endangered species; and cultural resources protection.

Analysis of the activities/facilities estimated under the M Scenario and the Louisiana, Mississippi, and Alabama CZM programs and local land use policies indicates that potential incompatibilities or conflicts can be avoided or effectively mitigated. A number of mitigating measures are listed or incorporated into the Federal regulatory mechanisms governing the proposed lease sale which provide effective control over effects addressed by the CZM programs. In addition, postsale proposals to use specific sites must go through necessary Federal, State, and local review and permitting procedures. Experience in the Gulf indicates that this regulatory framework can be sufficiently flexible to allow reconciliation of most site-specific problems which could emerge after a sale. Coastal management and local land use planning programs do not seek to prohibit or preclude these activities in the coastal region (although certain sensitive areas may be "off-limits" to some or all development); rather, they attempt to guide and control development to ensure that suitable procedures and sites are used and that potential conflicts and adverse impacts are mitigated.

Conclusion

The analysis indicates that it is possible for the estimated activities/facilities resulting from the proposed action to be designed, located, constructed, and operated in a manner such that the expected level of impact on state and local land use management policies will be very low.

Cumulative Impacts

Cumulative impacts on state and local land use management include the impacts of the proposed action as discussed above, plus impacts related to prior OCS sales and to major non-OCS impact producing factors affecting the coastal area.

Estimated facilities construction resulting from OCS sales held prior to the proposed action are included in Table IV-11. The estimated numbers and types of these facilities are as follows: 3-14 service bases; 0-1 pipe coating yard; 2-11 pipeline landfalls; 0-2 platform fabrication yard; and 0-3 gas processing plants. The likely potential locations for these new facilities are the same as described above and in the analysis of the total find scenario impacts in Section IV.D.1.e.(17).

Non-OCS factors include all those activities which can cause potentially major impacts to, or conflicts with, the policies, objectives, and regulatory requirements/guidelines of local land use plans and coastal zone management programs. Broadly stated, these activities include residential, commercial, industrial, agricultural, institutional, recreational, energy and transportation facility, and other development. It is noted that such development has had major adverse impacts on unique, valuable, and critical attributes of the coastal environment. In addition, such growth and development is expected to continue in many areas of the Louisiana, Mississippi, Alabama, and Texas coast. This future growth and development, as in the past, is expected to stress and threaten to cause potentially major adverse impacts to environmental and socioeconomic resources in the coastal region.

Applicable provisions of the LCRP, MCP, and ACAMP which could affect future activity and development in the coastal zone, including new facilities described above, are discussed under the preceding analysis of the proposed action.

Analysis of the activities/facilities considered in this cumulative impact analysis and the CZM programs and local land use plans indicates that potential impacts, incompatibilities, or conflicts can be avoided or effectively mitigated. A number of mitigation measures are listed or incorporated into the Federal regulatory mechanisms governing the proposed lease sale which provide effective control over effects addressed by the CZM programs. As previously noted, all post-sale proposals to use specific sites for a particular activity/facility must go through necessary Federal, State, and local review and permitting procedures. Experience has shown that this administrative framework could be sufficiently flexible to allow reconciliation of most site-specific problems. CZM and local land use planning programs do not seek to prohibit development in the coastal area (although some areas may be "off-limits" to certain development); rather, they attempt to guide and control development to ensure that suitable procedures and sites are used and that potential conflicts or adverse impacts are mitigated. This analysis assumes that these programs, plans, and regulations will be effective.

Conclusion

It is considered possible for the estimated OCS-related and most non-OCS-related activities/facilities to be designed, located, constructed, and operated so that the expected level of impact on state and local land use management policies would be low.

(18) Impacts on Ports and Marine Transportation

The role of ports and the marine transportation they support is vital to the Gulf coast region. It is one of the busiest areas in the country for waterborne commerce (Section III.C.7.) and also supports a major commercial fishing fleet. OCS leasing can impact these activities. The impacts on ports are related to the demand for additional port and harbor space which generally involves temporary and permanent service bases (used in expected exploration, delineation, and development well drilling) and facilities necessary for the shipment of platform and pipeline materials. The impacts on marine transportation involve problems associated with increased vessel traffic and the emplacement of fixed structures.

Most of the impacts on ports and marine transportation will take place during the development phase of oil and gas operations resulting from the proposed action. Vessels traveling between the coast and offshore sites during normal supply and work crew transport will result in an increase in ship traffic in the area's harbors, traffic lanes, and the offshore region. These service boats, barges, and drilling and mud ships may travel outside the customary traffic patterns of open water shipping. Such increases in oil- and gas-related vessel traffic and their patterns of movement will increase the probability of conflicts. Slow-moving vessels engaged in pipe laying activities will also operate in a manner inconsistent with normal activities.

Pipeline construction operations involve a lay barge, 1-3 tugboats, and several pipe supply vessels. Impacts would be limited to the time required to lay the pipeline. Trips by service vessels will continue throughout all phases of OCS operations; however, as exploratory and development related activities decline, associated material transport and service trips will also decline. The remaining production related trips (worker transport, supply, and service) will become standard. These trips will be primarily directed between onshore operation bases and offshore production areas.

Navigational or operational errors in the vicinity of structures may result in collisions. Consequences might include injury, loss of life, oil spills, and release of debris. The release of a ship's cargo could present a serious threat to the environment if the cargo is hazardous. Vessel to vessel collisions and vessel collisions with OCS structures have been relatively few due to the existing network of fairways in the Gulf (Section I.B.4.a.), the traffic coordination and regulation of marking requirements for rigs and platforms by the USCG, and the issuance of permits for the erection of structures on the OCS by COE (COE now issues a nationwide permit, as discussed in Section I.B.4.a.). As shown on Table III-13, there were over 47,000 trips made by ships (with drafts of 18 ft or greater) crossing Gulf waters in 1982 and over 3,050 OCS structures as possible obstructions. From 1964-1982, there were 20 significant collisions with OCS structures.

The impacts of the proposed actions on ports and marine transportation will be evaluated according to the following criteria:

Very High - Traffic is expected to increase by more than 25%. Additional docks, berths, and facilities will be required beyond the expansion capabilities of existing ports. Traffic congestion and increased accidents will necessitate significant changes in existing traffic patterns.

High - Traffic is expected to increase by 15%-25%. Additional docks, berths, and facilities will be required. There may be traffic congestion problems in and near harbor access channels, increasing the likelihood of accidents and necessitating some changes in traffic patterns.

Moderate - Traffic is expected to increase by 5%-15%. Some new facilities may be required, but major expansion or renovation should not be necessary. Traffic congestion and the likelihood of accidents will increase, but no changes in traffic patterns should be necessary.

Low - Traffic is expected to increase by 1%-5%. Minor expansion of existing facilities may be required, and there may be a slight increase in traffic congestion.

Very Low - Traffic is expected to increase by less than 1%. No expansion of existing facilities will be necessary, and traffic congestion should not noticeably increase.

The analysis of the specific vessel traffic expected to result from each proposed sale in the peak year of activity is based on the number of trips per exploratory rig and the number of trips per platform during development well drilling and during production. The number of trips is doubled in the analysis to reflect trips to and from work sites. These numbers are compared to the number of trips by all vessels to and from ports in each planning area in 1982 as reported by COE (Table III-13). It should be noted the that information from COE indicates that the trend in waterborne commerce has continued its nationwide decline. For purposes of these analyses, projected levels of vessel traffic are expected to remain constant (1982 levels) through the peak years of activity resulting from the proposed actions.

Impact Analysis

The CAA has the busiest and most established onshore service bases supporting the offshore oil and gas industry in the region. It also had the most vessel trips to and from its ports in 1982; more than double that of the Eastern Gulf and WAA combined. The CAA also has the highest projected increases in traffic as a result of the proposed action, but the percentages of increase are relatively low because of the high levels of existing traffic. If an area has already reached its saturation point, these increases, though low in percentage, could create conflicts. Vessels heading to and from the Mississippi River accounted for about a quarter of the traffic in the CAA, indicating that this area could be nearing saturation. Most of the ports that will be affected by the sale are located west of the Mississippi, however, and are not saturated. In many cases, these ports have land prepared for expansion and are competing with one another for new business.

The impacts of the proposed action are evaluated only for areas within the CAA since traffic resulting from the proposed action will most likely utilize shore bases within the area.

Vessel traffic in subarea C-1 is expected to increase by 6% or 2,600 trips in the peak year of activity resulting from the proposal (1991) over the 1982 level of 41,134 trips. Ports likely to be affected are Cameron and Intracoastal City. Traffic in subanalysis area C-2 is expected to increase by 7% or 4,100 trips in the peak year over the 1982 level of 56,765. Ports likely to be affected are Dulac, Leeville, Morgan City, and Fourchon. Traffic in subanalysis area C-3 is expected to increase by 3% or 2,600 trips in the peak year over the 1982 level of 88,147. Ports likely to be affected are Grand Isle, Harvey, and Venice. Traffic in subanalysis area C-4 is expected to increase by less than 1% or 300 trips in the peak year over the 1982 level of 82,294. Ports likely to be affected are Mobile and Pascagoula.

Twenty structures are expected to be emplaced as a result of the proposed action: five in C-1; nine in C-2; five in C-3; and one in C-4. It is unlikely that these structures will be a significant hazard to navigation if regulations requiring adequate marking are adhered to. The CPA already has over 2,800 structures on the OCS, so most who are involved in operations in the area are familiar with the potential problems. If foreign vessels and others who may not be acclimated to navigating in such an area stay within the unobstructed safety fairways, problems should be minimal.

Conclusion

Increased vessel traffic expected in the peak year of activity and new structures resulting from the proposed action indicate that impacts on ports and marine transportation will be moderate in subareas C-1 and C-2, low in C-3, and very low in C-4.

Cumulative Impacts

The impact analysis for the proposed action is based on expected increases in OCS-related vessel traffic over existing traffic levels in the CAA. These existing levels include all known potential impact producing factors, with the exception of the expected impacts associated with future exploration, development, and production associated with prior sales and the possible affects of the 1985 opening of the Tennessee-Tombigbee Waterway. The new waterway linking the Tennessee River with the Tombigbee-Black Warrior River system and ultimately the Port of Mobile will almost certainly affect traffic levels at Mobile and other Gulf ports. However, the possible effects are not quantifiable at this time. Future OCS activities associated with prior sales and the proposed action are expected to increase vessel traffic levels in subarea C-1 by 22% or 8,900 trips in the peak year of combined activity (1987) over the 1982 level of 41,134. Traffic in subarea C-2 is expected to increase by 25% or 14,200 trips in the peak year over the 1982 level of 56,765. Traffic in subarea C-3 is expected to increase by 10% or 8,900 trips in the peak year over the 1982 level of 88,147. Traffic in subarea C-4 is expected to increase by 1% or 1,000 trips in the peak year over the 1982 level of 82,294.

The development of infrastructure associated with prior OCS lease sales is expected to result in 140 additional platforms. These, combined with the 20 platforms resulting from the proposal, indicate that 160 platforms will be emplaced in the CPA: 40 in C-1; 72 in C-2; 40 in C-3; and 8 in C-4. The addition of these to the 2,800 structures already in place could have a significant impact on navigation in the area, but for the fact that the emplacement of the structures would be placed over a period of about 13 years, which should provide ample time for mariners to adapt to this 6% increase in the number of platforms in the CPA.

Conclusion

Increased vessel traffic, structures, and all other potential impact producing factors indicate that during the peak year of combined activity (1986) the cumulative impacts on ports and marine transportation will be high in subarea C-1, very high in C-2, moderate in C-3, and low in C-4.

b. Impacts from Alternative B - Delay Action

Delaying the sale is addressed as an alternative because delays have occurred in previous sales. While there are no specific issues in the CPA known at this time which might cause a delay, it is possible that a delay could occur for reasons that may arise before the sale is finalized.

Delaying the sale would withhold unleased blocks in the CPA for up to a 1-year period until Central Gulf Sale 110 (April 1987) is held, or until a later point in time on the 5-year schedule. Historically, no extension date has been given and the basic assumption is that all impacts associated with the action would be delayed for a comparable period of time.

Impact Analysis

All impacts associated with Alternative A (as discussed above in Section II.A.1.) would be delayed until such time as the sale is reinstated.

Conclusion

If the sale is delayed, all impacts will also be delayed for the same period of time.

Cumulative Impacts

Although the impacts of the proposed action would be delayed, the overall levels of cumulative impacts potentially caused by existing and future OCS leasing (excluding the proposed action) and other activities affecting the resources of concern are expected to be essentially the same as those summarized in Table S-3 and described in detail in Section IV.D.1.a.

c. Impacts from Alternative C - No Action

Impact Analysis

This alternative is equivalent to cancellation of a sale scheduled for a specific timeframe on an approved 5-year OCS Oil & Gas Leasing Schedule. Therefore, the opportunity is foregone or postponed for development of the estimated 0.15 billion bbls of oil and 1.23 tcf of gas in the Central Gulf, which could have resulted from this proposed sale. This could cause alteration of the energy mix at the National/regional level and could exert movement toward other energy alternatives.

Development of alternative energy supplies as replacement resources for lost domestic OCS oil and gas production include energy conservation; conventional oil and gas supplies; coal; nuclear power; oil shale; tar sands; hydroelectric power, solar and geothermal energy; and imports of oil, natural gas, and LNG.

These alternatives are examined below:

> Energy Conservation: Existing conservation programs include education, research and development, regulation, and subsidies. Several of these strategies have been implemented by the Energy Policy and Conservation Act of 1975 (P.L. 94-163).

Conventional Oil and Gas Supplies: Conventional oil and gas supplies still exist in large quantities in the United States. The amount of recoverable reserves will depend, however, on price, technology, geological information and public policy such as price controls, access to Federal lands, and environmental standards.

Coal: Coal is the most abundant energy resource in the United States and could replace the energy expected to be realized from this lease sale, but serious limitations to coal development exist. Coal use and production are restricted by government constraints, limited availability of low sulfur deposits, conversion and pollution abatement technology, and the hazardous environmental impacts associated with coal use. However, the Power Plant and Industrial Fuel Use Act of 1978 encourages greater use of coal by prohibiting all new electric power plants and large industrial boilers, and existing ones after 1990, from consuming oil or natural gas as a primary fuel source unless an exemption is granted.

Nuclear Power-Fission: Nuclear power development has encountered manufacturing and technical problems, as well as delays in licensing, siting, and environmental constraints. Future capacity will be influenced by the availability of plant sites, plant licensing considerations, environmental factors, nuclear fuel costs, capital costs, and rate of development of the breeder and fusion reactors.

Oil Shale: Although the oil shale resource base is very large, development poses serious environmental problems that may restrict availability of this energy source. Processing operations consume large quantities of water, which is in limited supply in the western area of the United States where supplies with the greatest commercial potential are found. The constraints of distribution, which are analogous to petroleum transportation, are the primary consideration for the Gulf of Mexico coastal region.

Tar Sands: Tar sands are deposits of porous rock or sediments that contain hydrocarbon oils too viscous to be extracted by conventional recovery methods. Only minor production efforts have been developed in the United States.

Hydroelectric Power: Hydroelectric power is not likely to represent a feasible alternative energy source because of high capital costs, seasonal variations in waterflows, land use conflicts, environmental effects, water use, and flood control constraints.

Solar Energy: Solar energy is a diffuse, low intensity energy source with a wide range of potential applications. Solar energy collection systems are now commercially available nationwide. The high initial cost of solar units are a deterrent to their use, however. Large-scale generation of electricity using solar energy is a promising application that is receiving increased consideration.

Geothermal Energy: Geothermal energy presently accounts for minimal amounts (less than 1%) of energy production in the United States. Some potential for future development exists in the Gulf Coastal Plain of Texas and Louisiana. Possible ground subsidence is an associated environmental consideration.

Imports of Oil, Natural Gas, and LNG: A national policy aimed at reducing energy imports has been successful; imports of petroleum in May 1981 were the lowest in a decade. The more dependent the United States is on energy imports, the more vulnerable the nation is to economic and strategic instability. The primary hazard to the natural environment of increased energy imports is the possibility of oil spills or of a fire or explosion during transportation, transfer, or storage, particularly with LNG.

It is difficult to predict the extent to which the development of alternative energy supplies may be necessary since other factors are involved, such as the continuing success of energy conservation by the American public, overcoming technical and economic barriers that presently exist in developing other alternative energy sources, and improving resource recovery methods to increase the rate of recovery. For more information on these alternative approaches to our Nation's energy needs, refer to the following: Energy Alternatives: A Comparative Analysis (Oklahoma, University of, 1975) which was prepared under contract for BLM; Final Environmental Statements OCS Sale 58 (USDI, BLM, 1979a) and OCS Sale 70 (USDI, MMS, 1982b); Environmental Quality - 1982 (CEQ, 1982); and Reference Paper #9, Energy Alternatives (USDI, BLM, 1979b).

The economic impacts of cancellation of a sale could be far-reaching. Increased exploration activity on recently acquired leases could partially offset a one-year delay, resulting in negligible socioeconomic impacts. A lengthy delay, however, could seriously affect the economic stability of the coastal region. The infrastructure for oil and gas production in the Gulf of Mexico is highly concentrated in the coastal areas of Louisiana and Texas. The OCS oil and gas program is a major source of employment and revenue in the area. Approximately 130,000 jobs are directly or indirectly dependent on the offshore program. The average annual payroll associated with oil and gas activities amounts to approximately $2.9 billion for the Gulf Coast region. The state and local taxes generated annually by the Federal program are approximately $232.6 million. Cancellation of a sale could reduce the amount of exploration activity, the number of exploratory wells drilled, the number of workers and facilities employed by the industry and the payroll and tax revenues generated.

All positive and negative impacts associated with the proposed action (as discussed in Section II.A.1.) would be cancelled.

Based on the resources estimated by MMS for the M Scenario, Table IV-50 presents the energy equivalents that may be required from several alternative energy sources should this lease sale be permanently cancelled. For the purpose of clarity, this table has separately identified each potential alternative source of energy regarding substitution requirements. It is unlikely, however, that there would be a single choice between these alternative sources, but instead, some combined effort to further explore and develop many or all of these forms as a substitute for OCS oil and gas production.

Conclusion

If no action is taken on this sale, all environmental impacts that could have occurred under Alternative A will be avoided. Some adverse socioeconomic impacts could include a loss of employment opportunities, payroll revenues, and tax revenues.

Cumulative Impacts

Although the impacts of the proposed action would not occur, the overall levels of cumulative impacts potentially caused by existing and future OCS leasing (excluding the proposed action) and other activities affecting the resources of concern are expected to be essentially the same as those summarized in Table S-3 and described in detail in Section IV.D.1.a.

d. Low, High, and Total Find Scenarios

(1) Description

(a) Low and High Find Scenarios (L and H Scenarios)

The L and H Scenarios are analyzed to provide information on the reasonably foreseeable range of potential exploration, development, and production activities and facilities, and related impacts that might occur as a result of the proposed action. The L Scenario is based on the low resource estimates for which there is a 95% chance that more than the amount estimated is present. The H Scenario is based on the high resource estimates for which there is a 5% chance that more than the amount estimated is present. These estimates are of the conditional, unleased, undiscovered, economically recoverable resources in the area being offered by the proposed action.

The resource recovery and offshore infrastructure estimates related to the proposed action are included in Table IV-1. The distribution of resources and infrastructure by subplanning area are included in Tables IV-4 and IV-5. Resource and related infrastructure estimates compared to those for the M Scenario are 50%-60% less under the L Scenario and 80%-110% higher under the H Scenario.

Table IV-50

Replacement Energy Needs
Central and Western Planning Areas

	Central	Western
BTU equivalents: *(trillion BTU)		
Oil - .06 billion barrels	336.0	
- .03 billion barrels		168.0
Gas - .70 trillion cubic feet	714.7	
- .50 trillion cubic feet		510.5
Oil equivalents: *(billion barrels)		
Oil from other sources needed to directly replace expected oil production	.06	.03
Oil from other sources needed to replace expected gas production	.128	.091
Gas equivalents: *(trillion cubic feet)		
Gas from other sources needed to replace expected oil production	.329	.165
Gas from other sources needed to directly replace expected gas production	.70	.50
Coal equivalents: *(billion short tons)	.044	.028
Electrical equivalents: *(Generators with a billion watts of capacity per hour)		
Substitutes for end uses**	.953	.615
Substitutes as input to electricity generation***	.586	.378

Notes: * Conversion factor used:
1 barrel of oil = 5.6 x 10^6 Btu.
1 cubic foot of natural gas = 1,021 Btu.
1 ton coal = 24 x 10^6 Btu.
1 kilowatt hour = 3,412 Btu at the theoretical conversion rate of other energy forms to electricity at 100% efficiency.

** Based on a 65% average efficiency of end use of oil and gas (such as oil and gas heating) and a plant load factor of 80% average plant life of 30 years.

*** Efficiency of fossil fuel electricity generation was assumed to be 40%. The plant load factor equals 80% average plant life of 30 years.

The estimated timetables for offshore exploration, development and production activity are included in Table IV-2. Exploration and development activity is estimated to occur over a somewhat shorter time period under the L Scenario, while under the H Scenario a somewhat longer time period is needed compared to the M Scenario estimates. Production activity would occur over an estimated 18-year period under both scenarios.

Transportation assumptions for the L and H Scenarios are the same as those described under the M Scenario.

New onshore facility use estimates are shown in Table IV-51. The estimated number of new facilities, compared to the M Scenario, is somewhat lower under the L Scenario and somewhat higher under the H Scenario.

(b) Total Find Scenario (T Scenario)

The T Scenario is used for the analysis of the impacts associated with continued OCS sales beyond the proposed action. This scenario is based on trends in the level of leasing and related resource recovery estimated for areawide lease sales. It assumes that recent trends will continue and hypothesizes the discovery, development, and production of the total undiscovered economically recoverable resources (mean conditional estimates) in the planning area as a result of the proposed action and subsequent OCS lease sales occurring over a 25-30 year period. Production resulting from future OCS sales is hypothesized to continue for about 40 years. This scenario is considered a reasonably foreseeable, if not likely, event in view of the projected demand for hydrocarbon feedstocks and the effort to achieve the National goal of energy independence, in part, by increasing or maintaining Federal offshore hydrocarbon exploration, development, and production.

Resource and offshore infrastructure estimates for the T Scenario are presented in Table IV-52. The geographic extent and amount of acreage offered in the planning area is the same as for the M, L, and H Scenarios. The CPA contains estimated recoverable resources of 2.44 billion bbls of oil and 18.80 tcf of natural gas. The estimated peak year amounts of offshore exploration, development, and production activity are also shown in Table IV-52.

The distribution of resources and related offshore infrastructure by subplanning area is shown in Table IV-53. The distribution is based on assumptions and estimates concerning the amounts and locations of undiscovered economically recoverable resources in each planning area.

It is estimated that oil and gas production will be connected to existing and new transmission pipelines (including 5-15 new pipeline landfalls) for transportation to existing and new processing facilities in Louisiana, Mississippi, and possibly Texas.

The major types and numbers of existing and new facilities estimated to be used in support of offshore development in the CPA, including their distribution by coastal subarea, are shown in Table IV-54.

Coastal subarea C-1 is estimated to be the location for the following new facilities: possibly two (0-2) service bases for exploratory drilling; 1-2 service bases for development/production operations; possibly one (0-1) gas processing plant; and 1-2 pipeline landfalls. Likely potential locations for these facilities include Cameron, Vermilion, and Iberia Parishes, except that a pipeline landfall is not estimated for Iberia Parish.

Coastal subarea C-2 is estimated as the location for the following new onshore support facilities: 1-2 service bases for exploratory drilling; 1-3 service bases for development/production operations; possibly one (0-1) pipe coating yard; possibly one (0-1) platform fabrication yard; 1-2 gas processing plants; and 2-7 pipeline landfalls. Likely potential locations for these new facilities include St. Mary, Terrebonne, and Lafourche Parishes.

Coastal subarea C-3 is the estimated location for the following new onshore support facilities: possibly one (0-1) service base for exploratory drilling; 1-2 service bases for development/production operations; possibly one (0-1) gas processing plant; and 1-5 pipeline landfalls; and possibly one (0-1) platform fabrication yard. Likely potential locations for these new facilities include Jefferson, Plaquemines, and St. Bernard (pipeline landfall only) Parishes.

Table IV-51

Onshore Facility Use Estimates: Central Planning Area
(L and H Scenarios)

Facility	L Scenario	H Scenario
Service Base (Development/Production)	-	0-2[3]
Pipeline Landfalls	0-2[1]	1-4[4]
Miles Onshore Pipeline	0-40[2]	20-80[5]
Gas Processing Plant	-	0-1[6]

Notes: The following notes indicate the number of new facilities by coastal subarea (Figure IV-1):

[1] 0-1 in C-2 and 0-1 in C-3: likely potential locations are St. Mary, Terrebonne, and Lafourche Parishes in C-2; and Jefferson, Plaquemines, and St. Bernard Parishes in C-3.

[2] 0-20 in C-2 and 0-20 in C-3: same likely potential locations as indicated for the pipeline landfalls.

[3] 0-1 in C-2 and 0-1 in C-4: likely potential locations are St. Mary, Terrebonne, and Lafourche Parishes in C-2; and Jackson County, Mississippi, and Mobile County, Alabama.

[4] 0-1 in C-1, 1-2 in C-2, and 0-1 in C-3: likely potential locations are Cameron and Vermilion Parishes in C-1; St. Mary, Terrebonne, and Lafourche Parishes in C-2; and Jefferson, Plaquemines, and St. Bernard Parishes in C-4.

[5] 0-20 in C-1, 20-40 in C-2, and 0-20 in C-3: same likely potential locations as indicated for the pipeline landfalls.

[6] 0-1 in C-2: likely potential locations are St. Mary, Terrebonne, and Lafourche Parishes.

Source: USDI, Minerals Management Service, Gulf of Mexico OCS Region estimates.

Table IV-52

Resource and Offshore Infrastructure Estimates: Central Planning Area (T Scenario)

	CPA
Resources Expected to be Developed[1]	
Oil (billion bbls)	2.44
Gas (tcf)	18.80
Offshore Infrastructure	
Exploration Wells[2]	4,000
Platforms[3]	320
Production Wells	3,200
Pipeline (miles)	1,480
Peak Year Activity[4]	
Exploration Wells Drilled[2] (no./yr.)	295/1993
Platforms Installed[3] (no./yr.)	23/1994
Production Wells Drilled (no./yr.)	230/1995
Oil Production (million bbls/yr.)	146/2002
Gas Production (billion cf/yr.)	1,128/2004

[1] Mean conditional estimates of the total unleased, undiscovered, economically recoverable resources (oil and gas expected to be discovered and produced).

[2] Includes delineation wells.

[3] Production.

[4] Only first year of multi-year peak periods is given.

Source: USDI, Minerals Management Service, Gulf of Mexico OCS Region estimates.

Table IV-53

Estimated Distribution of Resources and Offshore Infrastructure by Subplanning Area: Central Planning Area (T Scenario)

	C-1	C-2	C-3	C-4
Resources Recovered				
Oil (billion bbls)	0.30	1.38	0.76	(1)
Gas (tcf)	2.82	9.40	5.64	0.94
Infrastructure				
Exploration Wells (2)	600	2,080	1,200	120
Platforms	43	170	100	7
Production Wells	430	1,720	980	70
Pipeline (miles)	250	760	390	80

(1) Less than 10 million bbls.

(2) Includes delineation wells.

Source: USDI, Minerals Management Service, Gulf of Mexico OCS Region estimates.

Table IV-54

Onshore Facility Use Estimates: Central Planning Area (T Scenario)

	Total		Coastal Subarea C-1		Coastal Subarea C-2		Coastal Subarea C-3		Coastal Subarea C-4		Coastal Subarea W-2	
Facility	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New
Service Bases												
Exploratory Drilling	17+	1-6	4+	0-2	6+	1-2	5+	0-1	1+	0-1	1+	0
Development/Production	11+	3-8	3+	1-2	4+	1-3	3+	1-2	0-1	0-1	1+	0
Pipeline Installation	3+	0-1	1+	0	1+	0	1+	0	0-1	0-1	0-1	0
Pipe Coating Yard	3+	0-3	1+	0-1	1+	0-1	1+	0	0-1	0-1	0-1	0
Pipeline Landfall	4+	5-15	1+	1-2	1+	2-7	1+	1-5	1+	1	0-1	0
Miles Onshore Pipeline	1+	45-275	1+	10-40	1+	20-140	1+	5-75	1+	10-20	0-1+	0
Marine Terminal	0	0	0	0	0	0	0	0	0	0	0	0
Platform Fabrication Yard	4+	0-4	1+	0-1	1+	0-1	1+	0-1	1+	0-1	0-1	0
Gas Processing Plant	7+	1-5	2+	0-1	2+	1-2	2+	0-1	1+	0-1	0-1	0
Refinery	4+	0	1+	0	1+	0	1+	0	1+	0	0-1	0

Source: USDI, Minerals Management Service, Gulf of Mexico OCS Region estimates.

Coastal subarea C-4 (the Mississippi and Alabama portion of the central Coastal Area) is estimated to be the location for the following new onshore support facilities: possibly one (0-1) service base for exploratory drilling; possibly one (0-1) service base for development/production operations; possibly one (0-1) new service base for pipeline installation; possibly one (0-1) new pipe coating yard; 1 new pipeline landfall; possibly one (0-1) new gas processing plant; and possibly one (0-1) platform fabrication yard. Likely potential locations for these facilities include Jackson County, Mississippi, and Mobile County, Alabama.

(2) Impact Analysis

(a) Impacts on Sensitive Coastal Habitats (Wetlands)

Low Find Scenario Impacts: In the CPA, onshore infrastructure development consisting of 0-40 miles of pipeline in coastal subarea C-1 is the only development projected. Up to 480 acres of sensitive coastal habitats could be destroyed, altered, or disturbed. This level of impact represents 0.03% of the wetlands in subarea C-1. One large spill (1,000 bbls or greater) contact and several smaller spill contacts are assumed with marshes, mangroves, and/or seagrass beds. Based on the analysis, the expected impact is low in coastal subareas C-1 and C-4, and high in coastal subareas C-2 and C-3.

High Find Scenario Impacts: In the CPA, onshore infrastructure development consisting of from 0-2 development/production facilities, from 0-1 gas processing plant, and from 20-80 miles of pipeline could result in destruction, alteration, or interference with sensitive coastal habitats. Impacts by coastal subarea could occur as follows: C-1, up to 240 acres; C-2, between 240 and 630 acres; C-3, up to 240 acres; and C-4, up to 75 acres. The maximum percentage of the sensitive coastal habitats affected in any one coastal subarea is 0.05% (C-2). One large spill (1,000 bbls or greater) and several smaller spill contacts are assumed with marshes and mangroves. Based on the analysis, the expected impact is moderate in coastal subareas C-1 and C-4, and high in coastal subareas C-2 and C-3.

Total Find Scenario Impacts: The assumed number of oil spill contacts (greater than or equal to 1,000 bbls) with vulnerable sensitive coastal habitats is two. Additionally, a number of smaller spill contacts with sensitive coastal habitats are assumed. These spill contacts could have potentially moderate or very high impacts depending on the sensitive coastal habitats in the areas contacted.

In coastal subarea C-1, a number of new OCS support/processing facilities are estimated that could cause impacts to sensitive coastal habitats (Table IV-54). Up to two oil/gas transmission pipelines making landfalls in three possible locations are estimated. Potential locations for landfall/routing sites include the: Cameron area: up to one pipeline, resulting in the destruction of up to 12 acres of coastal wetlands; and Grand Chenier area: up to one pipeline, resulting in the destruction of up to 42 acres of coastal wetlands; and Abbeville area: up to one pipeline, resulting in the destruction of up to 132 acres of coastal wetlands. Additionally, a number of new onshore support facilities could be constructed. A maximum loss of up to 105 acres of sensitive coastal habitats could occur if indeed these facilities are located in coastal wetlands. Using the maximum expected wetlands losses due to pipeline construction of 174 acres, the total loss of sensitive coastal habitats in coastal subarea C-1 amounts to a maximum of 279 acres. This represents a loss of 0.02% of these habitats in coastal subarea C-1. The estimated impact in coastal subarea C-1 is high.

In coastal subarea C-2, a number of new OCS support/processing facilities are estimated that could cause impacts to sensitive coastal habitats (Table IV-54). Up to seven oil/gas transmission pipelines making landfalls are estimated. Up to three pipelines could be routed to each of the following places: Patterson (St. Mary Parish); Dulac (Terrebonne Parish); or Golden Meadow (Lafourche Parish). The pipelines to Patterson could result in the destruction of up to 504 acres of wetlands; the pipelines to Dulac, up to 432 acres of wetlands; and the pipelines to Golden Meadow, up to 432 acres of wetlands. If the pipelines (3) going into St. Mary Parish are routed to Franklin rather than Patterson, a maximum destruction of only 252 acres of wetlands would be likely. Additionally, a number of new onshore support facilities could be constructed. A maximum loss of 805 acres of sensitive coastal habitats could occur if these facilities are located in coastal wetlands. Using the maximum estimated wetlands losses due to pipeline construction of 1,224 acres, the total loss of sensitive coastal habitats in coastal area C-2 amounts to a maximum of 2,029 acres. This represents a loss of 0.2% of these habitats in coastal subarea C-2. The estimated impact in coastal subarea C-2 is very high.

In coastal subarea C-3, a number of new OCS support/processing facilities are estimated that could cause impacts to sensitive coastal habitats (Table IV-54). Up to five oil/gas transmission pipelines are estimated. Up to two pipelines could make landfall in Jefferson Parish (one or both could go to Grand Isle, Golden Meadow, or Lafitte); up to three could make landfall in Plaquemines Parish (possibly one could go to Venice, one to Buras, one to Empire); and up to two could make landfall in St. Bernard, continuing to Yscloskey. The maximum amounts of wetlands destruction caused by one pipeline landfall and onshore routing to the indicated places are as follows: Grand Isle - 12 acres; Golden Meadow - 156 acres; Lafitte - 205 acres; Venice - 156 acres; Buras - 96 acres; Empire - 120 acres; and Yscloskey - 120 acres. Consequently, five pipelines in this coastal subarea could destroy up to 756 acres of wetlands. Additionally, the construction of a number of new onshore support facilities is estimated. These facilities are likely to be located in previously developed areas. Should this not be the case, up to 640 acres of wetlands could be destroyed. The maximum total wetlands losses due to pipeline and other facility construction would be 1,396 acres. This represents a loss of 0.1% of these habitats in coastal subarea C-3. The estimated impact in coastal subarea C-3 is very high.

In coastal subarea C-4, a number of new OCS support/processing facilities are estimated that could cause impacts to sensitive coastal habitats (Table IV-54). One oil/gas transmission pipeline landfall is estimated. The Pascagoula area and the Bayou La Batre/Mobile area are each likely potential locations for a pipeline landfall. Up to three acres of seagrass beds could be destroyed near Horn or Petit Bois Islands from the pipeline making landfall near Pascagoula. It is likely that no sensitive coastal habitats would be impacted by a pipeline going into the Mobile area since this is a highly developed area, especially if the pipeline is routed through Mobile Bay. If the pipeline makes landfall in the Bayou La Batre area, up to three acres of seagrass beds could be temporarily destroyed north of Dauphin Island and three acres of wetlands could be permanently destroyed on Dauphin Island. Additionally, the construction of a number of new onshore support facilities is estimated. These facilities are likely to be located in previously developed areas. Should this not be the case, up to 720 acres of wetlands could be destroyed. The maximum total wetlands losses due to pipeline and other facility construction would be 723 acres. This represents a loss of 0.7% of these habitats in coastal subarea C-4. The estimated impact in coastal subarea C-4 is moderate.

(b) Impacts on Sensitive Offshore Habitats

Low Find Scenario Impacts: Table IV-1 indicates the possibility of considerable activity in the CPA: 140 exploration and delineation wells; 8 platforms; 80 development wells; and 107 miles of pipelines. To the extent that these activities take place on the sensitive habitats of the Central Gulf, the impacts to these habitats could be very high. However, the imposition of the biological stipulations will reduce these potential impacts to very low (Section IV.D.1.a.(2)).

High Find Scenario Impacts: Table IV-1 indicates the possibility of considerable activity in the CPA: 700 exploration and delineation wells; 40 platforms; 400 development wells; and 320 miles of pipelines. To the extent that these activities take place on the sensitive habitats of the Central Gulf, the impacts to these habitats could be very high. However, the imposition of the biological stipulations will reduce these potential impacts to very low (Section IV.D.1.a.(2)).

Total Find Scenario Impacts: Table IV-52 indicates the possibility of considerable activity in the CPA: 4,000 exploration and delineation wells; 320 platforms; 3,200 development wells; and 1,480 miles of pipelines. To the extent that these activities take place on the sensitive habitats of the Central Gulf, the impacts to these habitats could be very high. However, the imposition of the biological stipulations, if they continue to be imposed, will reduce these potential impacts to very low (Section IV.D.1.a.(2)).

(c) Impacts on Water Quality

Low Find Scenario Impacts: The discharge of an estimated 0.0006-0.05 billion bbls of formation waters, 0.63 million bbls of drilling muds, 0.07 million yds^3 of drill cuttings, 0.03 million bbls of sand from drilling operations, and an average of 0.03 Mgal/day of treated sanitary and domestic wastes from platforms may be expected as a result of this scenario. Pipeline-related activities would result in the disturbance of some 0.246-0.642 million yds^3 of sediment.

Offshore and nearshore waters will be subject to impacts from discharges of drilling fluids, formation waters, and other effluents which add burdens of both toxic and nontoxic materials to the water column. However, the natural processes of dispersion, degradation, and sedimentation will result in immeasurably low concentrations of these materials within a few meters to a few kilometers of the discharge site, resulting in low impacts.

Discharge from onshore support facilities is estimated to be minimal with impacts to onshore water quality expected to be very low. These impacts may stem from the construction of 0-40 miles of onshore pipelines projected for this region.

High Find Scenario Impacts: The discharge of an estimated 0.0027-0.24 billion bbls of formation waters, 3.18 million bbls of drilling muds, 0.357 million yds^3 of drill cuttings, 0.135 million bbls of sand from drilling operations, and an average of 0.168 Mgal/day of treated sanitary and domestic wastes from platforms may be expected as a result of this scenario. Pipeline-related activities would result in the disturbance of some 0.736-1.92 million yds^3 of sediment.

Offshore and nearshore waters will be subject to impacts from discharges of drilling fluids, formation waters, and other effluents which add burdens of both toxic and nontoxic materials to the water column. However, the natural processes of dispersion, degradation, and sedimentation will result in immeasurably low concentrations of these materials within a few meters to a few kilometers of the discharge site, resulting in low impacts.

Discharge from onshore support facilities is estimated to be minimal with impacts to onshore water quality expected to be very low. These impacts may stem from the construction and operation of OCS onshore support facilities, particularly the 0-1 new gas processing plant, 20-80 miles of onshore pipelines, and 0-2 new service bases projected for the CPA.

Total Find Scenario Impacts: The discharge of an estimated 0.024-2.19 billion bbls of formation waters, 18.2 million bbls of drilling muds, 2.0 million yds^3 of drill cuttings, 1.22 million bbls of sand from drilling operations, and an average of 1.34 Mgal/day of treated sanitary and domestic wastes from platforms may be expected as a result of this scenario. Pipeline-related activities would result in the disturbance of some 3.5-9.2 million yds^3 of sediment.

Offshore and nearshore waters will be subject to impacts from discharges of drilling fluids, formation waters, and other effluents which add burdens of both toxic and nontoxic materials to the water column. However, the natural processes of dispersion, degradation, and sedimentation will result in immeasurably low concentrations of these materials within a few meters to a few kilometers of the discharge site, resulting in low impacts.

Discharge from onshore support facilities is estimated to be minimal with impacts to onshore water quality expected to be very low. These impacts may stem from the construction and operation of OCS onshore support facilities, particularly the 2-6 new gas processing plants, 0-4 new platform fabrication yards, 0-3 new pipe coating yards, 50-380 miles of onshore pipelines, and 4-14 new service bases projected for the Central Gulf.

(d) Impacts on Air Quality

Low Find Scenario Impacts: Estimates for the CPA include no new gas processing plants and no new or expanded refineries needed.

It is expected that 140 exploration and delineation wells, 80 development/production wells will be drilled, and 8 platforms will be added. New activity is expected to be evenly distributed throughout the CPA with the exception of subplanning area C-4, which expects only a minimum of activity resulting in one platform.

Low impacts are expected in St. Bernard, Plaquemines, St. Mary, Lafourche, St. Charles, Jefferson, Orleans, and St. John the Baptist Parishes in Louisiana and Mobile County, Alabama. Very low impacts are expected throughout the remainder of the coastal area of the CPA and in Escambia County in the Eastern Gulf.

High Find Scenario Impacts: Estimates for the CPA include possibly one (0-1) new gas processing plant and no new or expanded refineries needed. The location of the new gas processing plant is expected in coasal subarea C-2.

It is expected that 700 exploration and delineation wells and 400 development/production wells will be drilled, and 40 platforms will be utilized. New activity is expected to be evenly distributed throughout the CPA with the exception of subplanning area C-4, which expects only a minimum of activity. The overall impact on coastal air quality is expected to be moderate in the coastal areas of Mississippi/Alabama if an uncontrolled sour gas blowout occurs nearshore.

Low impacts are expected in St. Bernard, Plaquemines, St. Mary, Lafourche, St. Charles, Jefferson, Orleans, and St. John the Baptish Parishes in Louisiana and Mobile County in Alabama. Very low impacts are expected throughout the remainder of the coastal area of the CPA and in Escambia County in the Eastern Gulf.

Total Find Scenario Impacts: Estimates for the CPA include as many as five new gas processing plants and no new or expanded refineries needed. The locations of the new gas processing plants are expected in coastal subareas C-1, C-2, C-3, and C-4 with possibly one or two plants expected in any of these areas.

It is expected that 4,000 exploration and delineation wells, 3,200 development/production wells will be drilled, and 320 platforms will be utilized. Presently, there are approximately 2,800 structures in the Central Gulf. New activity is expected to be distributed throughout the CPA with the greatest level of activity occurring in subarea C-2 and a minimum of activity noted in subplanning area C-4. A total of 290 platforms are projected as a result of this and future lease sales.

Impacts are expected to be low to moderate. Moderate impacts are expected adjacent to areas where offshore activity is highly concentrated (subareas C-1, C-2, and C-3) and low in areas adjacent to minimal activity (subarea C-4).

(e) Impacts on Endangered and Threatened Species

Low Find Scenario Impacts: Analysis indicates a negligible probability (1%) of one or more oil spills greater than 1,000 bbls and several smaller spills occurring and contacting a sea turtle nesting beach along the Central Gulf coast. With only a few turtle nesting beaches in the CPA and a very low possibility of an oil spill contact, it is unlikely that potential oil spills related to this scenario would have an adverse impact on sea turtles.

OCS-related vessel traffic in the CPA is estimated to increase less than 1%. The level of OCS-related vessel collisions with marine turtles in the CPA is unknown; however, no adverse impacts have been reported or documented. No projected pipeline construction that would impact sea turtle nesting beaches is expected for the CPA coast area as a result of this scenario.

A very low level of impact on sea turtles and their habitat is expected in the CPA as a result of this scenario.

Analysis indicates a negligible probability (2%) of one or more oil spills greater than 1,000 bbls and several smaller spills occurring and contacting brown pelican nesting habitat along the Central Gulf coast. It is unlikely that potential oil spills related to the scenario would have an adverse impact on brown pelicans.

Aircraft and vessel traffic in the vicinity of pelican nesting areas is estimated to increase less than 1% and no projected onshore facility construction that would impact brown pelican nesting areas is expected.

A very low level of impact on brown pelicans and their feeding and nesting habitat is expected in the Central Gulf as a result of this scenario.

High Find Scenario Impacts: The OSRA indicates a low probability (21%) of one or more oil spills greater than 1,000 bbls and several smaller spills occurring and contacting a sea turtle nesting beach along the Central Gulf coast. With only a few turtle nesting beaches in the CPA and a very low possibility of an oil spill contact, it is unlikely that potential oil spills related to this scenario would have an adverse impact on sea turtles.

OCS-related vessel traffic in the CPA is estimated to increase less than 5%. The incidence of OCS-related vessel collisions with sea turtles in the CPA is unknown; however, no adverse impacts have been reported or documented.

Up to two development/production service bases and from one to four pipeline landfalls may be required in the CPA. It is unlikely that any of this onshore construction will occur near a sea turtle nesting beach in the CPA.

A very low level of impact on sea turtles and their habitat is expected in the CPA as a result of this scenario.

The OSRA indicates a low probability (16%) of one or more oil spills greater than 1,000 bbls and several smaller spills occurring and contacting brown pelican nesting habitat along the Central Gulf coast. It is unlikely that potential oil spills related to this scenario would have an adverse impact on brown pelicans.

Aircraft and vessel traffic in the vicinity of pelican nesting areas is estimated to increase less than 5%.

Up to two development/production service bases and from one to four pipeline landfalls may be required in the CPA. One or more of these onshore facilities could be located in Lafourche, Plaquemines, or St. Bernard Parishes, which could impact brown pelican nesting and/or feeding habitat.

A low level of impact on brown pelicans and their feeding and nesting habitat is expected in the CPA as a result of this scenario.

Total Find Scenario Impacts: Eight oil spills greater than 1,000 bbls and several smaller oil spills are expected with a high probability (65%) of occurring and contacting endangered species habitats. These potential oil spills are expected to have a low level of impact on endangered and threatened species in the CPA.

OCS-related aircraft and vessel traffic in the CPA is estimated to increase less than 5%. This increased OCS-related vessel traffic is less than 3% of the existing and projected commercial and recreational aircraft, vessel, and barge traffic in this area. About 30% of this non-OCS-related aircraft and boat traffic is in coastal and offshore areas inhabited by endangered species; this would increase the possibility of vessel collision with marine turtles. This potential aircraft and vessel traffic is expected to have a low level impact on endangered species.

Expanded and new onshore facilities in this area are listed in Table IV-54. This OCS-related construction would require less than 3% of the remaining coastal areas suitable for endangered species habitat that currently is being used for non-OCS-related commercial and residential structures in the coastal zone. This potential onshore construction is expected to cause a low level of impact on endangered and threatened species and their habitat in the CPA.

As a result of total development, the overall impact on endangered and threatened species in the Central Gulf is expected to be low.

(f) Impacts on Marine Mammals

Low Find Scenario Impacts: Analysis indicates a very low probability (9%) of one or more oil spills occurring and contacting coastal areas in the CPA. One oil spill greater than 1,000 bbls and several smaller spills are estimated to occur. With the low possibility of oil spill contacts in this area, it is unlikely that OCS-related oil spills resulting from this scenario will affect marine mammals in the CPA.

Vessel traffic in the CPA is estimated to increase less than 1%. The level of OCS-related vessel collisions with marine mammals in the CPA is unknown; no injuries or mortalities have been reported.

About 220 wells may be drilled, and additional seismic exploration may be required over the 18- to 20-year period of this scenario. Well drilling and seismic activities apparently do not pose a significant impact to marine mammals (Gales, 1982 and USDI, MMS, 1983f). No adverse impacts resulting from these activities have been reported or documented in the Gulf of Mexico region.

It is expected that OCS-related oil spills, collisions with offshore support vessels, and disturbance from OCS oil/gas activities will have a very low level of impact on marine mammals and their habitat in the Central Gulf as a result of this scenario.

High Find Scenario Impacts: The OSRA indicates a low probability (29%) of one or more spills occurring and contacting coastal areas in the CPA. One oil spill greater than 1,000 bbls and several smaller spills are assumed to occur. With the expected low contact of oil spills in this area, it is unlikely that OCS-related oil spills resulting from this scenario will affect marine mammals in the Central Gulf.

Vessel traffic in the CPA is estimated to increase less than 5%. The level of OCS-related vessel collisions with marine mammals in the CPA is unknown; no injuries or mortalities have been reported.

About 1,100 wells may be drilled, and additional seismic exploration may be required over the 18- to 20-year period of this scenario. Well drilling and seismic activities apparently do not pose a significant impact to marine mammals (Gales, 1982 and USDI, MMS 1983f). No adverse impacts resulting from these activities have been reported or documented in the Gulf of Mexico region. The disturbance is usually short-term and fairly localized, and it is unlikely to cause a major impact on marine mammals in the CPA (NMFS Biological Opinion, Appendix C).

It is expected that OCS-related oil spills, collision with offshore support vessels, and noise disturbance from OCS oil/gas activities will have a very low level of impact on marine mammals and their habitat in the Central Gulf as a result of this scenario.

Total Find Scenario Impacts: The expected number of oil spills greater than 1,000 bbls is two, with a high probability (85%) of occurrence.

OCS-related vessel traffic in the CPA is estimated to increase by about 5%. This increased OCS-related vessel traffic is about 5% of the existing and projected commercial and recreational vessel and barge traffic in this area. About 80% of this non-OCS-related vessel traffic is in coastal and offshore areas inhabited by marine mammals; this would increase the possibility of vessel collisions with these animals. This potential increase in OCS-related vessel traffic is expected to cause a low level of impact on marine mammals.

About 7,200 wells may be drilled and seismic exploration will occur on the blocks offered for leasing over the assumed 40- to 42-year period of this scenario. The majority of this disturbance and noise is usually short-term and localized, and the impact is believed to be low.

As a result of this scenario, the overall impact on marine mammals in the Central Gulf is expected to be low.

(g) Impacts on Coastal and Marine Birds

Low Find Scenario Impacts: The OSRA indicates a very low probability (9%) of one or more oil spills greater than 1,000 bbls occurring and contacting coastal areas in the CPA. One oil spill greater than 1,000 bbls and several smaller spills are assumed to occur. Considering the low occurrence of oil spills in this area, it is unlikely that OCS-related oil spills resulting from this scenario will affect coastal and marine birds in the CPA.

Disturbance of coastal and marine bird nesting and feeding habitat from onshore construction and associated noise from aircraft, boat, and vessel traffic could result in a reduction or elimination of birds that use the habitat for feeding and nesting. Dredging and the construction of pipelines and roads could change hydrology that may result in complete conversion of a marsh ecosystem.

No projected onshore facility construction that would impact coastal and marine birds is expected.

A very low level of impact on coastal and marine birds and their feeding and nesting habitat is expected in the Central Gulf as a result of this scenario.

High Find Scenario Impacts: The OSRA indicates a low probability (29%) of one or more spills greater than 1,000 bbls occurring and contacting coastal areas in the CPA. One oil spill greater than 1,000 bbls and several smaller spills are assumed to occur. Considering the low expected contact of oil spills resulting from this scenario, it is unlikely that OCS-related oil spills will affect coastal and marine birds in the CPA.

Disturbance of coastal and marine bird nesting and feeding habitat from onshore construction and associated noise from aircraft, boat, and vessel traffic could result in a reduction or elimination of birds that use the habitat for feeding and nesting. Dredging and the construction of pipelines and roads could change hydrology that may result in complete conversion of a marsh ecosystem.

Up to two development/production service bases and from one to four pipeline landfalls may be required in the CPA. This onshore construction could impact coastal and marine bird nesting and/or feeding habitat.

A low level of impact on coastal and marine birds and their feeding and nesting habitat is expected in the Central Gulf as a result of this scenario.

Total Find Scenario Impacts: Two large spill (1,000 bbls or greater) contacts and several smaller spill contacts are assumed with land. The impact of these spills on coastal and marine birds is expected to be moderate.

Expanded and new onshore facilities in the Central Gulf are listed in Table IV-54. This OCS-related construction would require less than 5% of the remaining coastal areas suitable for coastal and marine habitat that currently is being utilized for the construction of non-OCS-related commercial and residential structures in the coastal zone. This potential onshore construction is expected to cause a moderate level of impact on coastal and marine birds in the CPA.

As a result of this scenario, the overall impact on coastal and marine birds and their habitat in the Central Gulf area is expected to be moderate.

(h) Impacts on the Commercial Fishing Industry

Low Find Scenario Impacts: Eight offshore platforms/structures are expected in the CPA, eliminating less than 0.1% (24-40 acres) of trawling area. Of these eight offshore platforms/structures, two are expected for Analysis Areas C-1, three for C-2, two for C-3, and one for C-4. Fishermen would absorb some economic loss through gear conflicts. A very low impact is expected on the commercial fishing industry.

High Find Scenario Impacts: Forty offshore platforms/structures are expected in the CPA, eliminating less than 0.1% (120-200 acres) of trawling area. Of these forty offshore platforms/structures, 10 are expected for Analysis Areas C-1, 18 for C-2, 11 for C-3, and 1 for C-4. One large spill (1,000 bbls or greater) and several smaller spill contacts are assumed with open bays. A large spill contact with an open bay could cause severe medium-term (1-3 years in duration) consequences to the invertebrate and vertebrate fisheries, and fishing could be deterred in these areas. The one assumed large spill contact is based on one assumed spill occurrence. This assumed spill occurrence could destroy fish eggs, larvae and juveniles, and localized fishing could be disrupted.

A high impact is expected on the commercial fishing industry.

Total Find Scenario Impacts: There are 1,257 platforms/structures in Analysis Area C-1, and 43 are expected for this scenario, eliminating less than 0.1% (129-315 acres) of the trawling area. The commercial catch in the inshore portion of this analysis area is approximately 6.9 million lbs/yr worth $3.6 million.

There are 1,507 platforms/structures in Analysis Area C-2, and 170 are expected for this scenario, eliminating less than 0.1% (510-850 acres) of the trawling area. The commercial catch in the inshore portion of this analysis area is approximately 28.4 million lbs/yr worth $21.6 million.

There are 799 platforms/structures in Analysis Area C-3, and 100 are expected for this scenario, eliminating less than 0.1% (300-500 acres) of the trawling area. The commercial catch in the inshore portion of this analysis area is approximately 270.8 million lbs/yr worth $38.6 million.

There are no platforms/structures in Analysis Area C-4. Seven are expected for this scenario, eliminating less than 0.1% (21-35 acres) of the trawling area.

If an oil spill greater than 1,000 bbls contacts the open bays in any of the analysis areas within 10 days of the spill, severe medium-term (1-3 years in duration) consequences could occur on the invertebrate and vertebrate fisheries, and fishing could be deterred in these areas. Another offshore oil spill could occur that is not expected to contact open bays. As a result of one or more of these offshore spills in the CPA, fish eggs, larvae and juveniles could be destroyed and localized fishing could be disrupted in this analysis area and also in the Western or Eastern Planning Areas if they are contacted by a spill.

Waters of the CPA could be contacted by 957 oil spills from 1-999 bbls with some possibly reaching State waters. These spills could result in localized short-term effects on fishery resources.

A high impact is expected on the commercial fishing industry.

(i) Impacts on Offshore Marine Recreational Fishing

Low Find Scenario Impacts: As noted in Table IV-1, only eight new production platforms would be required offshore to produce the estimated discoveries. With most of these structures likely to be installed in deep waters, far from shore, it is likely to cause little or no impact on recreational fishing. The expected impact is very low.

High Find Scenario Impacts: Table IV-1 indicates this scenario would result in approximately 40 new production platforms in the CPA. All these structures will function as de facto artificial reefs, and depending on location, some of these structures are likely to cause a low positive impact on recreational fishing. The expected impact would be low.

Total Find Scenario Impacts: As noted in Table IV-40, this scenario would require 320 additional offshore platforms. As the CPA is a mature oil and gas production area, most of the new structures are likely to be installed far from the Louisiana coast and would have little or no effect on marine recreational fishing. A few could be placed close to the Louisiana shoreline or more likely near the coast of Mississippi and Alabama and have a significant impact on sport fishing. As almost all of the offshore recreational fishing currently off the coast of Louisiana is directly associated with existing oil and gas production platforms, further development will perpetuate the "rig" fishing phenomena until most of the accessible offshore platforms are removed from the OCS. The expected impacts would be moderate.

Removal of offshore structures over time in the cumulative sense will have a very negative effect on offshore recreational fishing. Through 1983, 280 structures have been removed from the OCS and approximately 400 from State and Federal waters Gulfwide. Assuming an average production life of 25 years, almost 1,000 major production platforms (60%) will be removed from the OCS by the year 2000, just 16 years from now. Most of the older structures likely to be removed first are closer to shore and are the most popular fishing sites.

(j) Impacts on Major Shorefront Recreational Beaches

Low Find Scenario Impacts: No major spills are likely to occur and contact recreational beaches; therefore, there would be no adverse impact to shorefront recreational beaches under this scenario.

High Find Scenario Impacts: No major spills are expected to occur in the CPA and contact Louisiana, Mississippi, or Alabama beaches. If a spill were to occur (less than 5% probability), Louisiana beaches are most vulnerable, and impacts would be low.

Total Find Scenario Impacts: Table IV-19 indicates there is a low probability (23%) that at least one major oil spill and several smaller spills resulting from OCS leasing will occur and impact a major recreational beach in the CPA. Louisiana's recreational beaches are most vulnerable to the incremental pollution associated with future leasing on the OCS within the CPA.

Recreational use will be temporarily displaced from the areas directly impacted (1 week to 2 months) and beach sands may require cleaning or disposal and replacement. The impact to affected beaches would be moderate.

(k) Impacts on Cultural Resources

Low Find Scenario Impacts: The projected offshore development from this scenario would be approximately 40% of that projected under the Most Likely Find Scenario. Assuming an interaction occurs between an archaeological site and an impact producing factor, the impact levels would be moderate to very high; however, the already low risk of these impacts occurring would be reduced by approximately 40%.

The projected onshore development from this scenario would be approximatley 46% of that projected under the Most Likely Find Scenario. Assuming an interaction occur between an archaeological site and an impact producing factor, the impact levels would be moderate to very high; however, the already low risk of these impacts occurring would be reduced by approximately 46%.

There would be a negligible chance (1%) of an oil spill of 1,000 bbls or greater contacting a coastal archaeological site. Therefore, the expected impact would be very low.

High Find Scenario Impacts: The projected offshore development from the 1986 lease sale would be approximately twice that of that projected under the M Scenario. Assuming an interaction occurs between an archaeological site and an impact producing factor, the impact levels would be moderate to very high; however, the risk of these impacts occurring would be doubled.

The projected onshore development from this scenario would be approximatley 29% greater than that projected under the Most Likely Find Scenario. Assuming an interaction occurs between an archaeological site and an impact producing factor, the impact levels would be moderate to very high; however, the risk of these impacts occurring would be increased by approximately 29%.

There would be a 2% chance of an oil spill of 1,000 bbls or greater contacting a coastal archaeological site. Therefore, although the impacts would be low to very high depending on the type of site contacted and the uniqueness of the data lost, the risk of these impacts occurring would be doubled.

Total Find Scenario Impacts: The projected offshore development from this scenario would be approximately 12 times higher than that projected under the Most Likely Find Scenario. Assuming an interaction occurs between an archaeological site and an impact producing factor, the impact levels would be moderate to very high; however, the risk of these impacts occurring would be approximately 12 times higher.

The projected onshore development from the 1986 lease sale would be approximately eight times higher than that projected under the Most Likely Find Scenario. Assuming an interaction occurs between an archaeological site and an impact producing factor, the impact levels would be moderate to very high; however, the risk of these impacts occurring would be increased eight-fold.

There would be a very low chance (12%) of an oil spill of 1,000 bbls or greater contacting a coastal archaeological site. Therefore, although the impacts would be low to very high depending on the type of site contacted and the uniqueness of the data lost, the risk of these impacts occurring would be increased twelve-fold.

(l) Impacts on Tourist Activity/Industry

Low Find Scenario Impacts: Analysis indicates the likelihood that any recreational beach would be contacted by an oil spill is negligible in the CPA. This absence of spills will result in no effects on tourism activity from the this scenario.

There will be no impact of the proposed CPA sale on tourism activity in the Gulf Region.

High Find Scenario Impacts: The expected number (mean) of spill contacts (1,000 bbls or greater within 10 days) with Gulf beaches that are important for tourism is estimated by the OSRA at less than 0.05 during the 20-year project period of this scenario in the CPA. For analysis of potential impacts, any fraction is rounded up to one spill contact. The coastal areas that have a discernible chance (0.5% or greater) of being contacted by such a spill are in Cameron and Jefferson Parishes in Louisiana. Such a spill contact with the beaches in these parishes would cause tourism losses of $0.006 million (0.125%) in Cameron Parish and $1.48 million (0.5%) in Jefferson Parish. The probability that such a spill would occur is very low, as follows: Cameron 3% and Jefferson 2%. Therefore, a spill contact is considered unlikely.

There are no expected impacts of this scenario on tourism activity in the Gulf region.

Total Find Scenario Impacts: Tourism activity in the Gulf coastal region is expected to be measurably affected by future CPA OCS activity. Estimates of expected average annual losses in these areas were determined in the manner previously discussed in Section IV.D.1.a.(13). The expected number of spill contacts with Gulf beaches that are important for tourism is estimated by the OSRA at 0.3 during a 40-year project period of this scenario in the CPA. For analysis of potential impacts, this fraction is rounded up to one spill contact. The coastal areas that have a discernible chance (0.5% or greater) of being contacted by such a spill are in Cameron and Jefferson Parishes in Louisiana, the Hancock County area in Mississippi, Mobile County in Alabama, and Galveston and Jefferson Counties in Texas. One spill contact with the recreational beaches in these areas could cause total tourism losses during the year of the spill, as follows: Cameron Parish - $.006 million (0.1%); Jefferson Parish - $1.48 million (0.5%); Hancock County area - $53.75 million (25%); Mobile County - $7.19 million (3.4%); Galveston County - $26.2 million (12.4%); and Jefferson County - $5.1 million (3%). The effect on tourism expenditures would be intense during the period of the spill. The impact of an oil spill on tourism expenditures would be high in the Hancock County area, moderate in Galveston County, and low in the remaining areas. The effect on employment, payroll, and tax receipts would be minimal because of the limited duration of the spill.

The probability that such a spill contact would occur is as follows: Cameron Parish - 15%; Jefferson Parish - 8%; Hancock County area - 1%; Mobile County - 1%; Galveston County - 1%; and Jefferson County - 2%. Therefore, a spill contact is considered unlikely.

There are no expected impacts of this scenario on tourism activity in the Gulf region.

(m) Impacts on Military Use/Warning Areas

Low Find Scenario Impacts: The lowest number of wells anticipated being drilled in W-155 and W-453 would be four, and only one platform would result. With very little activity at present in W-155 and W-453, this projected level of activity would have a low impact on DOD operations.

Within W-92, the lowest number of wells anticipated as a result of this scenario would be seven and only one platform would result. With no activity at present in W-92, this projected level of activity would have a very low impact on DOD operations.

High Find Scenario Impacts: The highest number of wells projected to be drilled in W-155 and W-453 would be 20, and only one platform would result. With very little activity at present in these warning areas, the locations and service vessel and helicopter travel of seven exploratory drilling rigs and one platform over a period of 10 years would have a low impact in W-453 and a high impact in W-155, due to the nature and extent of DOD operations in each warning area.

Within W-92, the highest number of wells anticipated as a result of this scenario would be 38, and two platforms. With no activity in W-92 at present and a low intensity and frequency use by DOD, the impact level would be low.

Total Find Scenario Impacts: This scenario relates to oil and gas development from past sales, development as a result of the proposed action, and development resulting from future leasing. The major impact producing factors to be reviewed are the number and locations of platforms and the number of exploratory wells yet to be drilled. The number of exploratory wells and the numbers of platforms influences the number of service boat and helicopter trips into the warning areas.

At present, there are no platforms within warning areas 155 and 453, 2 platforms were proposed as a result of Sales 72, 81, and 98, and 18 platforms are projected as a result of future sales. By the year 2010, the total number of platforms within W-453 and W-155 could be 18. Because of the location of the resources most likely to be developed within W-453 and W-155 (see

Visual No. 13 for the area of high and moderate interest), most of these platforms will be fairly well distributed. Also, due to the geology and likelihood that natural gas will be the predominant find within the area, the platforms will be dispersed rather than concentrated.

From 1985 to 2010, 228 exploratory wells are predicted to be drilled within W-453 and W-155. The peak exploration is expected to be in 1991 with 25 wells. This means a maximum of nine drilling rigs in any year in W-228. The locations of these rigs is likely to be scattered throughout the warning areas.

The drilling rigs and platforms will generate a maximum of 2,808 trips by service boats when all platforms are installed in 2010, as well as nearly 15,330 helicopter trips. For military activities within W-453 and W-155, service vessel and helicopter trips could pose operational problems.

At present W-92 has no platforms located within it, 2 platforms were proposed to result from Sales 72, 81, 98, and 104, and 21 platforms are predicted to result from future leasing. By the year 2010, the total number of platforms within W-92 could be 25. Because of the location of the resources most likely to be developed (see Visual No. 13 for the areas of high and moderate interest) and the water depths within the area, most of these 25 platforms will be located in the northern one-third of W-92. Also, due to the geology of the oil and gas reservoirs in this region of the slope, the platforms will be more clustered around the structural traps.

From 1985 to 2010, 281 exploratory wells are predicted to be drilled within W-92. The peak exploration is expected to be in 1991 in W-92 with 22 wells. This means the maximum number of drilling rigs within the period 1985-2010 for any single year will be eight. The locations of these rigs is likely to be scattered throughout the northern half of W-92.

The drilling rigs and platforms will generate a maximum of 2,600 trips by service boats when all platforms are installed in 2010, as well as nearly 18,250 helicopter trips. For military activities within W-92 these service vessel and helicopter trips could pose operational problems.

By the year 2010, the impact of this scenario on military activities within W-155 will be high, and in W-92 and W-453 moderate.

(n) Impacts on Water Supply

Mitigation of water supply-related impacts would require prudent site selection of onshore support facilities in areas known to possess ample surface and groundwater supplies at present, and with water resource conservation and development plans for the future.

Low Find Scenario Impacts: No new service bases or gas processing plants will be constructed as a result of this scenario in the CPA. As a result of this, the impacts to the regional water supply are expected to be very low.

High Find Scenario Impacts: The addition of up to two new service bases and one new gas processing plant will impact area water supplies as a result of this scenario in the CPA. As a result of this, the impacts to the regional water supply are expected to be high, with several areas being substantially affected and requiring modification of existing facilities.

Total Find Scenario Impacts: The addition of up to 14 new service bases, 4 platform fabrication yards, and 6 new gas processing plants will impact area water supplies as a result of future OCS-related activities in the CPA. As a result of this, the impacts to the regional water supply are expected to be very high, with the regional supply being substantially affected and requiring facility expansion and possible water importation to areas lacking sufficient freshwater supplies.

(o) Impacts on Local Employment, Income, and Population

Low Find Scenario Impacts: This scenario is expected to generate a lesser level of employment in the Central Gulf coastal region than the Most Likely Find Scenario. The new resident activity, however, will be the same as under the M Scenario, since in both cases the new resident activity occurs only in 1987, and the levels of new resident employment, payroll, and population in that year are practically the same. The main difference between this scenario and the M Scenario is that the proposed action's activity will occur over fewer years and will maintain less of the 1987 (peak year) employment in later years. Based on this result, the impact in all Central Gulf coastal subareas of the proposed action generated new resident activity under this scenario is also expected to be very low.

High Find Scenario Impacts: This scenario is expected to generate a greater level of employment in the Central Gulf coastal region than the Most Likely Find Scenario. The new resident activity will also be higher. It is expected that this scenario's exploration forecasts will lead to peak new resident activity in 1987 only, as was the case in both the M and L Scenarios, and that the levels of new resident employment, payroll, and population related to the proposed action will be 2,552 jobs, $61.0 million, and 5,869 people, respectively. The breakdown of these new resident projections by coastal subarea is shown in Table IV-46. Based on these levels of new resident activity, the impact in all Central Gulf coastal subareas is expected to be very low since each represents less than 1% growth in total employment, income, and population.

Total Find Scenario Impacts: All future sales in the Central Gulf after 1985, based on existing undiscovered resource estimates, are analyzed. While this scenario is expected to generate a significant amount of jobs in the Central Gulf coastal region, the new resident activity is expected to be the same under the L and M Scenarios, as shown in Table IV-46. Again, the new resident growth in employment, income, and population is expected to occur in 1987 only in response to exploration activity associated with the proposed action. The main difference between this scenario and the L and M Scenarios is that the OCS-related activities generated in 1987 (peak year) will be maintained over several years and/or subject to more gradual declines because of continued OCS sales in the CPA. Based on this result, the impact in all Central Gulf coastal subareas of projected T Scenario activity is expected to be very low.

(p) Impacts on Community Infrastructure

Low Find Scenario Impacts: The estimated new resident employment under this scenario is equivalent to the estimates for the Most Likely Find Scenario discussed in Section IV.D.1.a.(16). The distribution of population is assumed to be comparable to the distribution indicated for the proposed action in Table IV-48. This low population growth will result in negligible effects on community infrastructure as a result of the proposed action.

Under the L Scenario, the impact of the proposed CPA sale on community infrastructure in the CPA will be very low.

High Find Scenario Impacts: An OCS-generated population growth of 5.9 thousand persons is estimated for this scenario. The peak impact would occur in 1987, with a distribution by coastal subarea as shown in Table IV-48. Coastal subarea C-1 is estimated to have an OCS-generated population growth of 2.1 thousand persons; C-2 is estimated to have 1.9 thousand persons; C-3 is estimated to have 1.4 thousand persons; and C-4 is estimated to have only 0.5 thousand persons. For all subareas, the average annual growth rate is less than 0.05%. Therefore, a very low level of impact is expected on community infrastructure.

Total Find Scenario Impacts: Table IV-48 (Section IV.D.1.a.(16)) includes the estimated OCS-generated population growth, which postulates the continuation of OCS sales and related exploration, development, and production until all economically recoverable resources are exhausted. The total OCS-generated growth is estimated at 1.1 thousand persons. This total is equivalent to that of the proposed action. The population growth is estimated to be distributed among 26 parishes/counties, with 32% of the total being concentrated in the 5 parishes of C-1. The estimated population growth rates in each of the potentially affected parishes/counties is less than 0.05% per year. These growth rates indicate a very low expected level of impact due to future OCS leasing and development on community infrastructure in each of the 26 potentially affected parishes/counties.

(q) *Impacts on State and Local Land Use Management*

Low Find Scenario Impacts: Major new facilities include: no service bases; 0-2 pipeline landfalls with 0-40 miles of onshore routing; no platform fabrication yards; and no gas processing plants, refineries or pipe coating yards. The 0-2 new pipeline landfalls with 0-40 miles of onshore routing (which would terminate at either a major transmission line or processing facility) could occur across the coastal parishes and counties with the most likely locations in subareas C-2 and C-3. Potential pipeline landfalls are estimated in all Louisiana's coastal parishes except Iberia, as well as in Jackson County, Mississippi, and Mobile County, Alabama. Applicable provisions of the LCRP, MCP, and ACAMP which could affect the activities/facilities estimated under this scenario, including any facilities described above, are discussed under the preceding analysis of the proposed action in Section IV.D.1.a.(17). On the basis of this analysis, it is considered possible for the estimated OCS-related activities/facilities under this scenario to be designed, located, constructed, and operated so that the expected level of impact on state and local land use management policies would be very low.

High Find Scenario Impacts: Major new facilities include: 0-2 service bases, 1-4 pipeline landfalls with 20-80 miles of onshore routing; no platform fabrication yards; 0-1 gas processing plant; and no refineries.

The new service bases are likely to be located at existing port/industrial areas which specialize in servicing offshore oil and gas development such as those at Cameron, Intracoastal City, Port of New Iberia, Port of West St. Mary, Morgan City-Berwisk-Amelia area, Houma, Dulac, Leeville, Port Fourchon, Grand Isle, and Venice in Louisiana, and possibly Pascagoula in Mississippi, and the Mobile-Bayou LaBatre area in Alabama. The 0-1 new gas processing plant is estimated to be located in the Central coastal area with likely potential sites located in Cameron, Vermilion, Iberia, St. Mary, Terrebonne, Lafourche, Jefferson, and Plaquemines Parishes in Louisiana, and Jackson County, Mississippi. The 1-4 new pipeline landfalls with 20-80 miles of onshore routing (which would terminate at either a major transmission line or a processing facility) are estimated to occur across the coastal parishes and counties. Potential pipeline landfalls are estimated in all Louisiana's coastal parishes except Iberia, as well as in Jackson County, Mississippi, and Mobile County, Alabama.

Applicable provisions of the LCRP, MCP, and ACAMP which could affect the activities/facilities estimated under the H Scenario, including any new facilities described above, are discussed under the preceding analysis of the proposed action in Section IV.D.1.a.(17). On the basis of this analysis, it is considered possible for the estimated OCS-related activities/facilities under the H Scenario to be designed, located, constructed, and operated so that the expected level of impact on state and local land use management policies would be low.

Total Find Scenario Impacts: The major types and members of existing and new onshore facilities (including their potential locations) used in support of offshore development in the CPA are described in Section IV.A.2.d. The existing support service and processing infrastructure in Louisiana, Mississippi, Alabama, and Texas will be heavily utilized, but may not be sufficient for the peak demand levels; therefore, a considerable number of new facilities may be established.

Major new facilities in addition to these estimated under the Most Likely Find Scenario include: 4-15 service bases; 5-15 pipeline landfalls with 45-275 miles of onshore routing; up to four (0-4) platform fabrication yards; and 1-5 gas processing plants.

The new service bases are likely to be located at existing port/industrial areas which specialize in servicing offshore oil and gas development such as those at Cameron, Intracoastal City, Port of New Iberia, Port of West St. Mary, Morgan City-Berwisk-Amelia area, Houma, Dulac, Leeville, Port Fourchon, Grand Isle, and Venice in Louisiana, and possibly Pascagoula in Mississippi, and the Mobile-Bayou LaBatre area in Alabama. The new pipecoating yard would likely be located in either the Pascagoula or Mobile-Bayou LaBatre area in an existing port/industrial area. The new platform fabrication yards are likely to be located in one of the existing port/industrial areas in Cameron, Vermilion, Iberia, St. Mary, or Terrebonne Parishes. The Port of New Iberia and the Port of West St. Mary have ample sites for large facilities. The 1-5 new gas processing plants are estimated to be distributed throughout the Central coastal area with likely potential sites located in Cameron, Vermilion, Iberia, St. Mary, Terrebonne, Lafourche, Jefferson, and Plaquemines Parishes in Louisiana, and Jackson County, Mississippi. The 5-15 new pipeline landfalls with 45-275 miles of onshore routing (which would terminate at either a major transmission line or a processing facility) are estimated to be widely distributed across the coastal parishes and counties. Potential pipeline landfalls are estimated in all Louisiana's coastal parishes except Iberia, as well as in Jackson County, Mississippi, and Mobile County, Alabama.

Applicable provisions of the LCRP, MCP, and ACAMP which could affect the activities/facilities estimated under the T Scenario, including new facilities described above, are discussed under the preceding analysis of the proposed action in Section IV.D.2.a.(17).

Analysis of the activities/facilities estimated under this scenario and the CZM programs and local land use plans indicates that potential incompatibilities or conflicts can be avoided or effectively mitigated. A number of mitigation measures are listed or incorporated into the Federal regulatory mechanisms governing the proposed lease sale which provide effective control over effects addressed by the CZM programs. All post-sale proposals to use specific sites for a particular activity/facility must go through necessary Federal, State, and local review and permitting procedures. This administrative framework has been sufficiently flexible to allow reconciliation of site-specific problems which could emerge after a sale. CZM and local land use planning programs do not seek to prohibit development in the coastal area (although some areas may be "off-limits" to certain development); rather, they attempt to guide and control development to ensure that suitable procedures and sites are used and that potential conflicts or adverse impacts are mitigated. On the basis of this analysis, it is considered possible for the estimated OCS-related activities/facilities under this scenario to be designed, located, constructed, and operated so that the expected level of impact on State and local land use management policies would be low.

(r) Impacts on Ports and Marine Transportation

Low Find Scenario Impacts: Vessel traffic is expected to increase over existing traffic levels (1982) by only about 3% in subareas C-1 and C-2, 1% in C-3, and less than 1% in C-4 in the peak year of activity (1990) according to the L Scenario. This scenario also predicts that there will be an increase in the number of structures in the subareas as follows: two in C-1; three in C-2; two in C-3; and one in C-4. These factors indicate that impacts on ports and marine transportation will be low in subareas C-1, C-2, and C-3, and very low in C-4.

High Find Scenario Impacts: Vessel traffic is expected to increase over existing traffic levels (1982) by about 12% in subarea C-1, 14% in C-2, 6% in C-3, and less than 1% in C-4 in the peak year of activity (1991). This scenario also predicts that there will be an increase in the number of structures in the subareas as follows: 10 in C-1; 18 in C-2; 11 in C-3; and 1 in C-4. These factors indicate that impacts on ports and marine transportation will be high in subareas C-1 and C-2, moderate in C-3, and very low in C-4.

Total Find Scenario Impacts: Vessel traffic is expected to increase over existing traffic levels (1982) by about 28% in subarea C-1, 33% in C-2, 13% in C-3, and 2% in C-4 in the peak year of activity (1992). This scenario also predicts that there will be an increase in the number of structures in the subareas as follows: 43 in C-1; 170 in C-2; 100 in C-3; and 1 in C-4. These factors indicate that impacts on ports and marine transportation will be very high in C-1 and C-2, high in C-3, and low in C-4.

e. Unavoidable Adverse Impacts of the Proposed Action

Sensitive Coastal Habitats: There is a chance that one or more spills greater than 1,000 bbls could occur and contact land within 10 days over the production life of the proposed action. If an oil spill does contact sensitive coastal habitats, adverse environmental impacts could be high. Oil contamination could kill an undetermined amount of coastal vegetation, shellfish, and finfish and/or their larvae, and coastal birds. The adverse effects of oil on sensitive coastal habitats would be relatively long-term.

Construction of new pipelines/infrastructure is expected. Some unavoidable adverse impacts to sensitive coastal habitats are expected from this phase of oil/gas-related activities.

Sensitive Offshore Habitats: Minor decreases in primary productivity due to the mortality or functional impairment of plankton, benthic organisms (including coral communities), seagrasses, and algae will occur in localized areas of high turbidities generated by drilling fluids disposal and bottom sediments suspended by pipeline laying and burying operations.

Disruption will occur if fresh oil spills reach shallow sensitive biological features. Localized mortalities, selective and functional impairment would probably occur, thereby altering the community structure for an unknown, but brief, period of time.

Water Quality: Normal offshore operations would have unavoidable effects to varying degrees on the quality of the surrounding water if the proposal is implemented. Drilling, construction, and pipelaying would cause an increase in the turbidity of the affected waters for the duration of the activity periods, and, in the case of pipelines, could disturb settled pollutants. A turbidity plume, several hundred yards in length, could also be created by discharge of drill cuttings and the adherent drilling fluids. This, however, would only affect water in the immediate vicinity of the rigs. The discharge of treated sewage from the rigs and platforms would increase the levels of suspended solids, nutrients, chlorine, and BOD in a small area near the discharge points. Chronic spills from platforms and the discharge of formation waters will result in increases of hydrocarbon levels and possibly trace metal concentrations in the water column. Overall, the effect will be the degradation of water quality around platforms, although the extent of the impact will extend only from a few meters to a few tens of meters from the platform site. Unavoidable impacts to onshore water quality will also occur as a result of runoff from construction sites of new facilities, but these impacts will be localized in the vicinity of these sites, and of limited duration. Some additional impacts will accrue from increased sewage due to population growth in certain communities. Regulatory requirements of the State water authorities (under Federal and State regulations and guidelines) and some local jurisdictions would be applicable to most, if not all, of these potential impact situations. Therefore, the opportunity would exist to effectively mitigate potential impacts if applicable regulatory measures were strictly enforced.

Air Quality: Unavoidable adverse impacts to air quality would occur onshore adjacent to crude oil refineries, gas processing plants and areas of concentrated OCS activities. Unavoidable short-term impacts to air quality would occur near catastrophic events (oil spills, blowouts with fire, blowouts without fire) due to evaporation and combustion. Mitigation of long-term effects will be accomplished through existing regulations. However, short-term effects from nonroutine catastrophic events (accidents) are uncontrollable.

Endangered and Threatened Species: OCS-related oil/gas vessel traffic in the Central Gulf could result in some collision injuries to marine turtles. Oil spills could result in some injury or mortality to marine turtles and brown pelicans.

Marine Mammals: Some injury or mortality to individual marine mammals could result from OCS-related oil spills and/or collision with offshore support vessels.

Coastal and Marine Birds: Some injury or mortality to individual and/or local populations of coastal and marine birds could result from OCS-related oil spills.

Commercial Fishing Industry: Of the various types of fishing gear in use in the OCS areas, trawls have the greatest chance for operational conflicts with oil and gas activities. Losses may, however, be compensated under the Fishermen's Contingency Fund or other legal routes. Trawl nets can be snagged on underwater stubs causing damage or loss of the nets. In addition, it is conceivable that snags could damage underwater production equipment or pipelines causing a spill of oil and gas. Because safety equipment is installed, which shuts in production when a loss of pressure occurs, the likelihood of a major spill resulting thereby is considered very small. Less frequently, large objects which were lost overboard from petroleum industry boats, pipeline lay barges, and platforms are caught by fishing gear resulting in damage to the gear and/or its catch of fish; however, occurrence of this type of incident is low. Also, commercial fishermen would probably not harvest fish in the area of an oil spill, as spilled oil could coat or contaminate commercial fish species rendering them unmarketable. Other unavoidable adverse impacts include loss of fish space caused by installation of unburied pipelines, rigs, platforms, or by other OCS-related structures. There may be some localized competition for shore facilities.

Major Shorefront Recreational Beaches: Even though existing regulations and orders prohibit indiscriminate littering of the marine environment with trash, offshore oil and gas operations involving men, machines, equipment, and supplies is bound to result in some littering of the ocean. Human nature and accidents associated with offshore operations will contribute some floatable debris to the ocean environment which will eventually come ashore on major recreational beaches.

Military Use/Warning Areas: In this planning area, the trips of helicopters and service boats, and the location and number of exploration rigs and production structures will produce unavoidable adverse impacts on military use of the warning areas to the extent that military missions could be curtailed or shifted to another location within a warning area, in particular, within Warning Area 155.

Continued cooperation between industry, the USAF, and the Navy should prevent the loss of life and equipment when industry helicopters and service vessel traffic cross an intensively used warning area. Continued flexibility in operations by the USAF and Navy should help to maintain a joint usage of the warning areas.

Ports and Marine Transportation: A certain amount of interference between offshore structures and vessel traffic will occur as a result of the proposed actions. This could lead to an increase in accidents involving OCS vessels and structures. Most foreign flag vessels and others who may be unaware of the locations of structures in an area will generally use the extensive network of safety fairways, which provides clear passage 2 nmi in width through the developed areas of the Gulf (Section I.B.4.a.). Those more familiar with an area may choose not to use the fairways. Coast Guard regulations regarding structure safety lights and horns, and ship safety regulations are important factors in minimizing conflicts and preventing accidents between structures and vessels on the OCS. However, at night, in rough water and in fog, the potential for all accidents increases.

f. Irreversible and Irretrievable Commitment of Resources

Sensitive Coastal Habitats: An irreversible and irretrievable commitment of biological resources could occur where sensitive coastal habitats are impacted by frequent oil spills and chronic low level contamination with oil. Repeated contact with oil will destroy wetlands vegetation which results in soil erosion and land loss. Animals killed by oil spills constitute a permanent loss of coastal biota.

Construction and emplacement of infrastructure and pipelines in sensitive coastal habitats can result in the permanent loss of coastal wetlands due to mechanical destruction of plants and animals and due to land loss facilitated by saltwater intrusion followed by erosion of marsh soils.

Sensitive Offshore Habitats: An irreversible and irretrievable commitment of biotic resources would occur in areas subjected to intensive development. Oil spills and chronic low level pollution can injure and kill organisms at virtually all trophic levels. Mortality of individual organisms can be expected to occur, and possibly reduction or even elimination of a few small or isolated populations. The magnitude of these effects is nearly impossible to predict; Section IV.D.1.a.(2) identifies the types of impacts which can occur and the resources which are particularly sensitive to adverse impacts resulting from the proposed actions. However, our analysis indicates that any adverse impacts resulting from the proposed actions are expected to be short-term and very localized.

Cultural Resources: Although the expected impact to cultural resources as a result of the proposed action is uncertain, any interaction between an impact producing factor (drilling of exploratory, delineation, and development wells, placement of platforms, subsea completions, and pipeline installation) and a significant historic shipwreck or prehistoric site would destroy information contained in the site components and in their spatial distribution. This would be an irretrievable commitment of potentially unique archaeological data.

Local Employment, Income, and Population: The proposals would result in the production of certain OCS-related goods and services. To the extent that resources would be drawn away from other uses, production of goods and services in other areas of other types would be foregone. Steel products, specialized manpower, and capital constitute required resources which may be scarce; use of these resources for OCS needs means that other opportunities for their use might have to be foregone. While these resources may be reclaimed over time, their use as a result of the proposals would constitute an irreversible and irretrievable commitment of resources at a given point in time. To the extent that underemployed labor resources are used to fill new job opportunities, this would not constitute a cost to society in the form of foregone labor opportunities.

Oil and Gas Development: Leasing of the proposed blocks and subsequent development and extraction would represent an irreversible and irretrievable commitment of nonrenewable oil and gas resources. The estimated amount of resources recovered as a result of Sale 104 is presented in Table IV-1.

g. Relationship Between the Short-term Use of Man's Environment and the Maintenance and Enhancement of Long-term Productivity

The principal short-term use of the leased areas in the Gulf under the proposed actions would be for the production of an estimated 0.15 billion bbls of oil and an estimated 1.23 tcf of natural gas.

This activity would temporarily interfere with tourism in the region in the event of a major oil spill (1,000 bbls or more) contacting popular tourist beaches. The probability of such an occurrence within a 10-day period after a spill is 4%.

The short-term recovery of hydrocarbons may have long-term impacts on offshore biologically sensitive areas (Section IV.D.1.a.(2)) or cultural resources (Section IV.D.1.a.(11)).

The proposed leasing may also result in onshore development and population increases which may cause very short-term adverse impacts to local community infrastructure, particularly in areas of low population and minimal existing industrial infrastructure. However, these impacts will occur only in the very short run. A return to equilibrium can be quickly expected as population changes and industrial development are absorbed in expanded communities.

After the completion of oil and gas production, oil spills and their impacts will not occur, and the marine environment is generally expected to remain at or return to its normal long-term productivity levels. It has been recognized that continuous, low-level pollution from toxic chemicals, including oil, may adversely affect long-term ocean productivity. However, to date there has been no discernible decrease in long-term marine productivity in OCS areas where oil and gas have been produced for many years. Areas such as the Atlantic coast, which experienced repeated incidents of oil pollution as a result of tanker groundings during World War II, show no apparent long-term productivity losses, although baseline data do not exist to verify this. In other areas which have experienced apparent increases in oil pollution, such as the North Sea, some long-term effects appear to have taken place. Populations of pelagic birds have decreased markedly in the North Sea in recent years--prior to the beginning of North Sea oil production. Until more reliable data become available, the long-term effects of the chronic and major spillage of hydrocarbons and other drilling related discharges cannot be accurately projected. In the absence of such data, it must be concluded that the possibility of decreased long-term productivity exists as a result of the proposed actions. It is possible that such high value areas as the Flower Garden Banks will suffer long-term losses as a result of these proposed actions.

OCS development off Louisiana and Texas has supported recreational and commercial fishing activities. This has stimulated the manufacture and sale of larger private fishing vessels and special fishing and recreational equipment. Additionally, commercial enterprises such as charter boats have become heavily dependent on offshore structures for satisfying recreational customers. These proposed sales will increase these incidental benefits of offshore development. The platforms expected to result from the proposed actions will help replace those currently being removed where production has terminated. As the incidence of offshore fishing and diving has gradually increased in the past three decades, platforms (the focus of much of that activity) will eventually begin to gradually decline as mineral resources become depleted. In order to maintain the long-term productivity of site-specific, artificial locations attractive to fishermen and divers, some means, such as proliferation of artificial reef development programs, will need to eventually replace platform removals.

In summary, short-term environmental socioeconomic impacts would result from the proposed leasing schedule, including possible short-term losses in productivity as a result of oil spills. Long-term adverse environmental impacts are not expected with the biological and cultural resources stipulations committed as part of the proposed action, but some risk remains due to the potential for accidents. Oil and gas reserves would be lowered. Few long-term productivity or environmental gains are expected as a result of these proposed actions; the benefits of the leasing schedule are expected to be principally those associated with a medium-term increase in supplies of domestic oil and gas. While no reliable data exist to indicate long-term productivity losses as a result of OCS development, such losses are possible. However, to the extent that OCS development would replace imports of oil which would otherwise be required, such losses as a result of tanker-related oil spills may occur in the absence of these proposed actions.

2. Western Gulf Sale 105

a. Impacts from Alternative A - The Proposed Action

(1) Impacts on Sensitive Coastal Habitats

A general discussion of the major impact producing factors and their potential effect on sensitive coastal habitats (wetlands loss) is included in Section IV.D.1.a.(1). Also included in that section are the assumptions used in this analysis on the potential wetlands loss due to pipeline and other new OCS-facilities construction, and the description of the five levels of impact used in the analysis and conclusions.

Impact Analysis

One large spill (1,000 bbls or greater) contact with coastal counties containing sensitive coastal habitats is assumed for analysis purposes based on data in Section IV.A.5., Table IV-16. However, these counties (Nueces, Matagorda, Brazoria, and Galveston) contain no wetlands that are listed as exposed on Visual No. 14. Due to the fact that none of the wetlands are considered exposed, no large or smaller spill contacts are assumed (considered reasonably foreseeable) and no oil spill related impacts are estimated to occur.

In coastal subarea W-1, 0-1 development/production facility is estimated. It is likely that this facility, requiring up to 75 acres, would be located in a non-wetland area. If it is located in wetlands, up to 75 acres of sensitive coastal habitats could be destroyed. This represents a loss of 0.02% of these habitats in coastal subarea W-1.

In coastal subarea W-2, 0-1 oil/gas transmission pipeline is estimated. The likely potential locations for a pipeline landfall include Palacios (Matagorda County), Freeport (Brazoria County), and Port Arthur (Jefferson County). If a pipeline to Palacios is routed around the Matagorda Peninsula, it is likely that the only sensitive coastal habitats impacted would be seagrass beds, with temporary destruction of up to 6 acres; should it cross the Matagorda Peninsula, up to 12 acres of seagrass beds could be temporarily destroyed. Should a pipeline to Freeport traverse wetlands from the coastline to Freeport, up to 36 acres of wetlands could be permanently destroyed. It is possible to route a pipeline to Port Arthur through natural or man-made waterways to avoid wetland impacts. However, should this pipeline be placed entirely in wetlands, up to 180 acres of wetlands could be permanently destroyed. No other new facilities in either coastal subarea W-1 or W-2 are estimated to result from the proposed action. Thus, the impact on sensitive coastal habitats could be a maximum loss of 225 acres of wetlands in coastal subarea W-2. This represents a loss of 0.05% of these habitats in coastal subarea W-2.

It is noted that OCS-related postsale facilities construction must comply with pertinent Federal, State (including CZM consistency in all the Gulf States except Texas), and local regulations and permitting procedures. These regulatory procedures implement environmental policies which seek to avoid or mitigate adverse impacts. This analysis assumes that these policies and regulatory procedures will be at least moderately successful in effectively mitigating adverse effects on sensitive coastal habitats that could occur as a result of the proposed action.

Conclusion

The level of impact on sensitive coastal habitats is estimated to be very low in coastal subarea W-1 and low in coastal subarea W-2.

Cumulative Impacts

In addition to the impacts described above for the proposed action, the following other major impact producing factors are considered in relation to sensitive coastal habitats. The non-forested wetland habitat base, 875,245 acres, in the WCA is decreasing; however, no composite annual rate of decrease is available. Major factors affecting this loss are residential/urban/industrial development, submergence, and wave erosion (Shew et al., 1981). Submergence increases the depth, periodicity, and in some cases duration of given levels of salinity. Development replaces the sensitive coastal habitats with upland habitats. Wave erosion replaces the non-forested emergent wetlands with open water. In the absence of a reliable estimate of the rate of wetlands loss resulting from all factors, natural and man-induced, no estimate of the relative level of cumulative impact of the proposed action is attempted.

Cumulatively, the proposed action and prior OCS lease sales are estimated to result in new onshore facility construction which could cause the destruction of up to 2,608 acres of wetlands. This represents 0.27% of the wetland base in the WCA.

Four large oil spill (1,000 bbls or greater) contacts are assumed with sensitive coastal habitats as a result of Federal offshore and tankering activity. The following counties/parishes and targets have a reasonably foreseeable chance (1% or greater) of experiencing one of these spill contacts (the assumed number of spill contacts for analysis purposes and the percent chance of such a contact are included): Cameron - 1 (2%); Willacy - 1 (2%), Matagorda - 1 (9%), Brazoria - 1 (18%), Galveston - 1 (41%), and Jefferson - 1 (16%) Counties in Texas; and Cameron - 1 (41%); Vermilion - 1 (41%), Iberia - 1 (30%), St. Mary - 1 (3%), Terrebonne - 1 (65%) Parishes in Louisiana; Texas seagrass beds - 1 (41%); and Texas marshes - 1 (63%). In addition, one large spill contact resulting from State offshore activity and a number of smaller spill contacts are assumed with sensitive coastal habitats as a result of Federal and State offshore activity. These spill contacts are expected to damage sensitive coastal habitats in the area contacted. Studies by O'Neil et al. (1983) indicate effects of petroleum spills on marsh flora varies, long-term damage to oyster reefs is severe, and knowledge of impacts to seagrass beds is lacking. Distichlis spicata was reported killed by repeated application of crude oil during a 5-month interval (Wilson and Hunt (1975) in O'Neil et al., 1983). Recovery time of Spartina alterniflora from a crude oil spill was estimated at 1-3 years (Krebs and Tanner (1981) in O'Neil et al., 1983). The assumed spill contacts are estimted to cause a moderate level of impacts in coastal subareas W-1 and W-2, a high level of impact in coastal subarea C-1, and a moderate or high level of impact in coastal subarea C-2 depending on the specific coastal habitats contacted.

Conclusion

The expected level of cumulative impact on sensitive coastal habitats is estimated to be moderate in coastal subareas W-1 and W-2, high in coastal subarea C-1, and moderate or high in coastal subarea C-2 depending on the specific coastal habitats affected.

(2) Impacts on Sensitive Offshore Habitats

A general discussion of the factors which may produce impacts to offshore habitats may be found at the beginning of Section IV.D.1.a.(2).

Impact Analysis

The offshore resources of concern in the Western Gulf are the coral and coral communities associated with topographic features generally found along the shelf break of the Western Gulf (Section III.B.2.).

The 23 banks (topographic features) of the Western Gulf containing biological resources which are of concern are (Visual No. 11):

Bank	Crest Depth (m)	Bank	Crest Depth (m)
Mysterious Bank	70	Stetson Bank	30
Blackfish Ridge	60	Claypile Bank	38
Dream Bank	68	Applebaum Bank	76
Southern Bank	60	Coffee Lump	62
Hospital Bank	56	West Flower Garden Bank	24
North Hospital Bank	58	East Flower Garden Bank	16
Aransas Bank	65	MacNeil Bank	62
South Baker Bank	64	29 Fathom Bank	52
Baker Bank	58	28 Fathom Bank	52
Big Dunn Bar	61	Geyer Bank	60
Small Dunn Bar	63	Elvers Bank	70
32 Fathom Bank	52		

(It should be noted that 29 Fathom Bank and 28 Fathom Bank are located on the line between the CPA and the WPA and thus, are listed in both.)

Potential causes of adverse impacts to the resources from this proposal are oil spills (one large spill is assumed in the WPA), mechanical damage to organisms (and their habitat) due to drilling, anchors, pipeline and platform emplacement, and smothering by drilling fluids or cuttings; toxicity to organisms of drilling fluids components; and mechanical damage due to blowouts. These impact producing factors are discussed in Section IV.D.1.a.(2). The biological stipulation included in the proposed action will eliminate these threats to the biota of biologically sensitive areas except for accidental oil spills.

As explained in Section IV.D.1.a.(2), oil spills, although possible, are not expected to pose a significant threat to the biota of the topographic features because of the depths of water at which these banks crest; while the Flower Gardens crest at 16 m and 24 m, Stetson Bank at 30 m, and Claypile Bank at 38 m, all the other Banks of the WPA crest at 52 m or deeper. Although not extensively studied, it appears that the deepest oil is driven into the water column from a surface spill in 6 m, and even there it is found only in concentrations several orders magnitude lower than that shown to have an effect on marine organisms (Lange, 1985; McAuliffe et al., 1975 and 1981). All of the banks of the WPA crest well below 6 m. Furthermore, the fact that the topographic features are widely dispersed in the Western Gulf, combined with the probable random nature of spill locations, would serve to limit the extent of damage from any given spill to only one of the sensitive areas. Oil spills may occur from seafloor sources (pipeline accidents, oil well blowouts) or sea level sources (tanker accidents, leaks on the platform, etc.). Oil may be transported downward to some extent in the water column due to normal circulation processes but should not be transported below the pycnocline under normal conditions. Oil spilled from seafloor sources or spilled at the surface under certain circumstances, such as severe storms, may be entrained and transported for great distances in subsurface currents. This was the case for the Ixtoc-1 spill, where some oil released into the water column at the seafloor circulated in the Gulf below the surface for months before reaching the Texas coast (Section IV.B.6.b.). Such oil at depth could come in contact with the biologically sensitive topographic features (banks) of the Western and Central Gulf. It has been established, however, that at the East and West Flower Garden Banks subsurface currents moving around the banks prevent the settling and accumulation of most non-bank derived sediments (Texas A&M Research Foundation, 1983). Such currents would generally serve to sweep entrained subsurface oil past the banks in similar fashion, preventing prolonged contact with any organisms, and normally preventing adverse impacts that oil might induce. The Texas A&M Research Foundation report (1983) documents the geological and biological evidence that supports this conclusion. Since the other clear water shelf-edge banks are quite similar to the Flower Garden Banks at similar depths (Section III.B.2.), it follows that similar current conditions probably prevail around them as well. Currents that flow around the banks sweep them clear of all but the heavier bank-derived carbonate sediments. Such dynamic conditions would, in most cases, effectively shield the banks from most potential impacts due to oil impingement and accumulation unless the spill occurred on or very close to the bank. Particular concern has been expressed about the threat to the coral reef areas of the Flower Garden Banks from oil spills and other accidents, particularly to Block A-375 at East Flower Garden Bank and Block A-398 at West Flower Garden Bank (both in High Island Area, East Addition, South Extension), in which much of the actual living coral reefs of the Flower Gardens are found (Figures I-3 and I-4). Because of this concern, neither block is being offered in this proposed action. Nevertheless, one large oil spill (1,000 bbls or greater) contact is assumed with the Flower Gardens area (as delineated on the water surface) as a result of the proposed action (Section IV.A.5., Table IV-16). It is noted that the estimated probability of this spill contact occurring is low (1%). Such a spill contact is not expected to pose a threat to the biota of the topographic features because of the depth of water at which these banks crest. The problem of subsurface transport of oil is discussed in Section IV.B.6.b. The tops of the banks are often above the thermocline (Texas A&M Research Foundation, 1983), thus making the biota of the banks potentially susceptible to impingement by oil-laden subsurface water. However, it is expected that under normal conditions the subsurface currents flowing around the banks are strong enough to keep them clear of sediment (Texas A&M Research Foundation, 1983) and will also serve to keep the banks from accumulating any oil. With a platform at or very near the bank, the risk to the bank would increase in the event of a blowout or oil spill accident. Both events have low probabilities. Were one to occur, however, the effluents could impinge directly upon the edge of the bank. Impacts then could be serious to the local biota. Experience indicates that oil and gas are found in the vicinity of salt domes on which the topographic features of the Western Gulf are found. Destruction of the biota of such areas may have severe and long-lasting deleterious consequences on the specific commercial and recreational fisheries habitats affected, such as loss of habitat, loss of species (including prey species), destruction of hard substrate, and change in sediment characteristics, all of which may result in the reduction or loss of one or more fisheries. These areas also have intrinsic biological, ecological, and aesthetic values of their own which could be lost by such activities.

All the offshore resources of concern mentioned above would be at risk from drilling muds and cuttings discharges during drilling operations and to mechanical damage from construction activities were it not for the biological stipulations which will be included in leases on appropriate blocks which might result from this proposed action (Section II.B.1.c.(1)). Impacts from these activities are generally quite localized in extent. However, the damage caused by these activities to unique and productive communities, such as coral reefs and live bottoms, would be quite severe in the absence of the stipulation. Section IV.A.4.a. discusses the discharge of drilling effluents in some detail.

Considerable mechanical damage will be inflicted upon the bottom by normal and routine oil and gas operations. The drilling operation itself disturbs some small areas. Anchors from support boats and ships, floating drilling units, and pipeline laying vessels do a great deal of damage to live bottoms and corals. The area actually affected will depend on depth of water, length of chain, size of chain, wind, and current, but severe damage to sensitive communities can occur within the area. Pipeline emplacement also causes considerable disruption to the bottom (Section IV.C.2.). It is estimated that six acres of the bottom is physically disturbed per mile of pipeline laid; some 2,300-6,000 yd^3 of sediment are resuspended per mile of pipeline, depending on the size of the pipeline and depth of trenching (burial). Add to this damage caused by the eight anchors of the pipelaying barge and it is clear that considerable damage will be done if such activities are conducted in sensitive coral or live bottom areas. In fact, anchor damage is considered the most serious threat to coral reefs and live bottom areas. Anchor damage includes crushing and breaking of coral heads, and anchors often destroy a wide swath of sessile organisms as the anchor is dragged and the chain moves around as the vessel swings at anchor. The biological stipulation included as a part of this proposed action will prevent such damage to sensitive biological areas from oil and gas operations.

The most extensive study of the effects of oil and gas operations in the Gulf of Mexico was the Buccaneer Gas and Oil Field study funded by USEPA and conducted by NMFS. This was a comprehensive five-year study of an established multi-structure operation some 45 km (23 nmi) off Galveston Island. A summary of the findings of the study was reported by Caillouet et al. (1981). Some of the conclusions are:

> Impacts of the Buccaneer Field can be classified into those associated with the presence of the structures themselves and those associated with the Buccaneer Field contaminants from a number of sources. The presence of the structure contributed to scouring of surficial sediments and provided artificial reef substrate upon which a fouling community developed and to which a variety of fishes and other motile organisms were attracted or otherwise aggregated. Fishes and other motile organisms used these sites as sources of food and cover.
>
> The Buccaneer Field investigation was unable to detect impacts beyond 100 m from production platforms.
>
> Not only are various biotic communities attached or attracted to artificial reefs represented by gas and oil field structures, but recreational fishermen and divers concentrate their activities near these structures, thus subjecting important reef fish populations to heavy fishing pressures and making them more vulnerable to fishing. An advantage may be that the heavy fishing pressure reduces the residence time of such "captive" fish populations, thus reducing the amount of time that individual fish are exposed to contaminants, allowing less time for possible bioaccumulation of contaminants that may be harmful to man.

Blowouts can present a serious threat (due to burying to resuspended sediments) to important biological resources if one were to occur near a coral or live bottom area (Section IV.C.1.). Gas well blowouts generally pose far less environmental risk than do oil spills, resulting only in very high concentrations of suspended sediments and increased levels of gas in the water column very near the source of the blowout. To the extent that oil or condensate is present in the reservoir, some liquid hydrocarbons may also be injected into the water column. The suspended sediments may be carried some distance by currents, but the bulk of the sediments are redeposited within a few thousand meters of the blowout site. Low-molecular-weight-hydrocarbons (gases) will dissolve in the water column until saturation is reached; both gaseous and dissolved low-molecular-weight hydrocarbons will be released into the atmosphere within a few days of a blowout without major biological effect. Liquid hydrocarbons will be diluted to background levels within a few thousand meters distance from the blowout site and will degrade with time. Fortunately, blowouts are quite rare in the Gulf of Mexico; for instance, from 1970-1979, there were 52 blowouts in the Gulf which works out to a rate of 4.3 blowouts per 1,000 wells drilled and 3.9 blowouts per 10,000 completions and workover operations (Offshore, 1982). This is one blowout per 232.6 wells and one blowout per 2,564 completions and workovers. This is a very low rate of occurrence. From 1979-1982, there were 31 blowouts in the Gulf, 16 during drilling operations and 15 during nondrilling periods. This works out to one blowout per 273 wells drilled and one blowout per 336 completions. Again, this indicates a very low incidence of accidents. Two of these blowouts (1979-1982) contributed all of the 65 bbls (2,730 gallons) spilled as a result of blowouts. No identifiable environmental damage was caused by this spillage, which represents 0.0000056% of the oil produced on the OCS during those years (Fleury, 1983).

A minor blowout occurred in March 1980, only 4.3 nmi northeast of the East Flower Garden Bank, in High Island Area, East Addition, South Extension, Block A-368. This blowout occurred when gas-charged sediments blew through the casing, releasing a small quantity of drilling mud into the environment. There was no discharge of seabed sediments nor oil or liquid hydrocarbons. No slick or other sign of environmental pollution was observed; therefore, no studies were conducted to determine impact at the Flower Garden Banks or elsewhere. Although this was a minor accident in terms of environmental impact, the platform was heavily damaged by the explosion and fire; six fatalities and twenty-nine injuries resulted.

A massive gas well blowout occurred in November 1976, approximately 36 nmi west of the West Flower Garden Bank in High Island Area, South Addition, Block A-563. This blowout occurred when the gas blew out around the casing and resulted in a crater approximately 550 m in diameter by 110 m deep. The entire platform structure was lost in the crater. Studies at this blowout indicated that the sediments resuspended by the blowout tended to settle out very near the blowout site with all deposition occurring within 3,000 m. No environmental impact due to hydrocarbons in the water column was found (Brooks and Bernard, 1977), but it is clear that the volume of sediment resuspended by the blowout would have caused a great deal of mortality had it taken place within 3,000 m of a coral or live bottom area.

One other source of discharges into the Gulf from routine oil and gas operations, which is sometimes cited as a potential hazard to biological communities, is produced water. The preponderance of the evidence indicates that such discharges are not an environmental hazard (Neff, 1981; Petrazzuolo, 1981), but for completeness the following brief discussion is included (Section IV.D.1.a.(3)).

Formation water, also called produced water, is the liquid associated with the extracted oil and gas and must be removed and disposed of. Produced water is relict seawater but with anomalous ion ratios (Section IV.A.5.). The following discussion of produced water is taken largely from Koons et al. (Offshore Operators Committee, 1975).

> Produced waters generally contain appreciable concentrations of dissolved inorganic salts in which the principal cations are sodium, magnesium, and calcium. The principal anions are chloride, sulfate, carbonate, and bicarbonate. The concentrations of total dissolved constituents can vary over a wide range from a few milligrams per liter to as much as 350,000 mg/l. Collins (1974, 1975) reviewed the composition of many oil field waters and found that the majority contained high chloride concentrations. Hydrocarbons and some organic compounds may be present in produced waters at part per million levels. Dissolved oxygen may be present at low concentration in produced waters.

The study of the Buccaneer oil field offshore (USDC, NMFS, 1977) reported that produced water was discharged at a rate of 138 m^3 per day between January 1975-February 1976. The average oil content of this produced water was 25.1 ppm. Near-platform macrobenthic populations were depressed and had a high turnover rate as compared to the surrounding sea bottom; this may have been a result of increased scour action around the platform structure itself, but no cause-effect relationship was established. OCS Order No. 7 requires that all discharges must meet EPA standards which allow no more than 72 mg/l daily maximum of oil and grease discharge and 48 mg/l maximum monthly average (72 mg/l is equivalent to 72 ppm). Furthermore, produced water discharges near topographic features will have to be shunted to near the bottom as required by the biological stipulation.

The 23 banks listed at the beginning of this analysis all contain biological resources similar to typical Caribbean reef flora and fauna at similar depths, and many contain isolated patches of various corals, including reef-building corals (Bright and Rezak, 1976, 1978a, 1978b, and 1981; and Texas A&M Research Foundation, 1982 and 1983). The East and West Flower Garden Banks are the most complex and studied, and they contain the northern most examples of typical Caribbean coral reef communities. The impacts to these resources from oil and gas operations taking place immediately upon them would be very high and perhaps long-lasting, or even permanent. If complete communities are eliminated, which is possible because those areas are relatively small in size and are concentrated at these banks, recovery may be impossible. Some 20,314 hectares (50,195 acres) are included in the biologically sensitive areas of these banks.

As indicated above, oil and gas operations may cause severe damage to the relatively small coral and coral related communities of the topographic features of the Western Gulf assuming the operations take place on or near these important and sensitive habitats. If there is leasing around one of the 23 banks of the WPA, up to 4 platforms of the 20 expected from the proposed action could be installed near that feature. If this happens, and the platforms are on or near the sensitive biological resources, the impacts to those resources could be very high. If complete loss occurs, recovery may never take place; in any event, recovery time will be in terms of years. Damage to the Flower Garden Banks is of particular concern since the area has been nominated for marine sanctuary status and since there is considerable interest in that area by USEPA, NOAA, recreational fishing and SCUBA diving groups, and Texas and Louisiana. (This risk to the Flower Gardens is somewhat reduced by deferring two blocks from the proposed action.)

However, the biological stipulation (Section II.B.1.c.(1)), which is included in the proposed action, will serve to mitigate the potentially adverse impacts of oil and gas operations: (1) By creating "No Activity Zones" at the banks where the sensitive biota are located, the stipulation protects the high value coral and coral community habitats from all contact with oil and gas exploration and development activities. If no activities, including the construction of pipelines, take place, the harmful mechanical impacts of those activities cannot take place. (2) By creating, where appropriate, "1 Mile Zones" and "3 Mile Zones" ("4 Mile Zone" at the Flower Gardens) around these banks within which shunting and/or monitoring must take place, protection from the toxic and smothering effects of drilling muds is provided, and a method (monitoring) is provided to document that no impacts are occurring. If the monitoring shows that the activities are impacting the biota of the banks, the ORD can take additional steps to prevent or halt such harm. To date, all evidence in the Gulf strongly indicates that the provisions of the stipulations are successful in preventing harm to the biota of the topographic features from oil and gas exploration and development activities (Bright and Rezak, 1978b and 1981; Neff, 1981; Petrazzuolo, 1981; Texas A&M Research Foundation, 1982 and 1983).

Conclusion

Activities resulting from the proposed action will have a very low impact on the biota of these areas.

Cumulative Impacts

Oil and gas operations have been increasing around the topographic features of the Western Gulf, and this trend will no doubt continue in the future. Of the 238 blocks in the WPA which are near (i.e., within 3 nmi of the bank) biologically sensitive areas, 135 are currently under active lease (Appendix A). All oil and gas operations on these blocks and those leased as a result of the proposed action will be subject to the provisions of the stipulation. (This is true even on the few older leases which do not contain the stipulation, since MMS applies the provisions of the stipulation in all appropriate instances.) Thus, as explained above, oil and gas operations are not expected to have an adverse impact on these unique and sensitive biological habitats.

However, application of the stipulation cannot prevent catastrophic accidents such as blowouts. As mentioned above, a subsurface blowout can resuspend large amounts of sediments and can entrain oil in the water column. By establishing No Activity Zones, the stipulation will preclude blowouts directly on the banks. Nearby blowouts, however, may affect the bank if subsurface currents carry sediments or oil to the bank. In most cases, it is expected that the currents will sweep the contaminants around the bank rather than deposit them on the bank (Texas A&M Research Foundation, 1983). Some small fraction of the sediments or oil may reach a bank and come in contact with organisms; the extent of damage will depend on the amount of contaminant and the length of time it remains on the bank. Amounts are not expected to be high because of dilution, dispersion, settling, and current action (sweeping the contaminant around the bank). Length of time on the bank may be long for the heavier sediments, but these are likely to settle out rapidly and not reach the bank at all (Brooks and Bernard, 1977). Because of this, and because blowouts are very rare, the risk to the biota of the topographic features is considered to be very low. A pipeline break discharging oil into the water will have much the same impacts as an oil spill at the surface. Such oil will rapidly rise to the water surface and will behave like a surface oil spill, since it is unlikely that oil from a pipeline break will become mixed with large amounts of sediment. Pipeline breaks are rare in the Gulf of Mexico (Section IV.B.).

Pipeline construction is another potential threat to the biota of the banks. As explained above, pipeline emplacement resuspends a considerable amount of sediment, and the pipeline itself can physically crush organisms. However, the biological stipulation will operate to preclude pipeline construction on the sensitive areas, and resuspended sediments are deposited within a few meters of the disturbance and are not expected to reach the bank (see also the discussion of resuspended sediments due to blowouts above).

Damage to the biota due to toxic effects from drilling fluid constituents is not expected to occur because of the high rate of dilution and dispersion (see above; NAS, 1983). Smothering from depositon of drilling fluids and drill cuttings is likewise not expected to be of any consequence following the same reasoning as used above in the discussion of blowouts.

As explained above, oil spills are not considered to be a threat to sensitive offshore biological habitats because of the depth of water over the topographic features of concern. One large oil spill (1,000 bbls or greater) contact is assumed with the Flower Garden area (as delineated on the water surface) under the cumulative scenario (Section IV.A.5., Table IV-16). The probability of this spill contact occurring is low (11%).

Anchor damage is considered to be the most serious threat to coral and coral-community areas (Bright and Rezak, 1978b and 1981). The biological stipulation prohibits the anchoring of industry related vessels in the No Activity Zones; the stipulation does not, however, affect other activities such as fishing and sport SCUBA diving. No data are available on the extent to which such anchoring may take place. However, nearly all the banks are very close to (or even in) the shipping fairways that have been established in the Gulf, and since these banks are apparently well-known fishing areas, large ships which for some reason need to wait before entering a port may choose to do their waiting fishing a convenient bank. This practice may diminish as skippers become aware of the damage their anchors do to the biota of the banks. These activities may damage some portions of the biologically sensitive areas. Even though regulations of other agencies are in place prohibiting damage to corals (Section I.B.4.b.) and restricting anchoring on the Flower Gardens (Section I.B.6.a.), anchoring may still take place in emergencies or through ignorance of the regulations.

Blasting (using high explosives) through coral reefs to recover alleged sunken treasure, while seemingly improbable, has been reported to have occurred at Bright Bank in the CPA. No documentation of any damage has been made. Such activities are specifically prohibited by the Coral FMP (Section I.B.6.b.). However, any blasting that might take place would destroy large areas which, if large amounts of sediment and substrate were removed, would never recover to pre-blasting conditions.

Although USEPA has no ocean dumping permits presently in place, such activities could take place in the future. It is unlikely that ocean dumping permits would be issued for areas near the biologically sensitive areas, since USEPA shares the concern of DOI for the protection of such areas. In any event, DOI would have an opportunity to work with USEPA in designating ocean dumping areas, if the need for them becomes apparent, to ensure that they were located far enough away from areas of biological concern to have no impact upon these areas.

Conclusion

OCS oil and gas activities are expected to have a very low impact on the biologically sensitive areas of the WPA OCS. However, other activities, especially anchoring right on sensitive topographic features, may cause high levels of ecological damage.

(3) Impacts on Water Quality

The nature of impacts on ambient water quality from routine discharges resulting from the proposed action will be the same as those generic impacts for the Central Gulf (Section IV.D.1.a.(3)), with major differences being primarily quantitative in nature.

(a) Offshore

Impact Analysis

Impacts to offshore water quality will occur as a result of increased OCS activities in the Western Gulf. The addition of some 320 exploration/delineation wells, 170 development/production wells, 20 platforms, and up to 160 miles of pipelines are estimated for this area under the M scenario. Under this scenario, the discharge of an estimated 0.001-0.09 billion bbls of formation waters, 1.45 million bbls of drilling muds, 0.1635 million yds^3 of drill cuttings, 50,000 bbls of sand from drilling operations, and an average of 84,000 gallons/day of treated sanitary and domestic wastes from platforms may be expected as a result of this alternative (Table IV-55). Pipeline-related activities would result in the disturbance of up to 0.96 million yds^3 of sediment under the same scenario. Most offshore impacts would be localized around OCS facilities and will be of a temporary nature due to dilution and dispersion characteristics of the receiving body of water. One oil spill greater than or equal to 1,000 bbls is assumed for the Western Gulf, according to the Oil Spill Risk Analysis (Section IV.B.2). Petroleum hydrocarbons introduced into the marine and coastal waters as a result of this spill may have varied effects on the local biota with impacts ranging from negligible to very high, depending on the resource impacted, the stage of weathering, and the local physical and meteorological parameters. Normal weathering processes, encountered with oil spilled into open water conditions, tend to detoxify the spilled oil by breaking down the toxic components of the oil. (See Section IV.B.4. for a discussion of fates and effects of spilled oil.)

Immediate effects would be brought on by increased drilling, construction, and pipelaying activities, causing an increase in water column turbidities of the affected waters. Such increases would have a nominal impact on the productivity of phytoplankton, but may cause a temporary clog in the respiratory and feeding mechanisms of numerous benthic and pelagic marine organisms within the area of construction. Pipeline construction activities may also result in the resuspension of settled pollutants, toxic heavy metals, and pesticides if present.

The discharge of treated sanitary wastes from the various rigs and platforms will increase levels of suspended solids, nutrients, chlorine, and BOD in a small area near the point of discharge. However, as a result of treatment prior to discharge, as is required through EPA's NPDES discharge permitting program, when combined with seawater these constituents are quickly diluted.

During the course of exploration drilling and workover phases resulting from the proposed action, the discharge of drilling fluids, cuttings, and sand will degrade the quality of the

Table IV-55

M Scenario Estimates of Effluent Discharges Due to Increased OCS Activities as a Result of Western Gulf Sale 105

Year	Barrels of Produced Waters (billion)	Exploration and Delineation Derived		Platform Derived Domestic and Sanitary Wastes (gal/day)	Sediment Disturbed by by Pipelaying Activities (yd^3)
		Drill Cuttings (yd^3)	Drilling Muds (bbl)		
1986	- -	-	-	-	-
1987	- -	5,110	45,500	-	-
1988	0.000002 - 0.00018	10,220	91,000	2,900 - 5,500	6,900 - 18,000
1989	0.000010 - 0.00090	17,885	159,250	5,800 - 11,000	11,500 - 30,000
1990	0.000025 - 0.00225	30,660*	273,000*	11,600 - 22,000	16,100 - 42,000
1991	0.000050 - 0.00450	30,660	273,000	20,300 - 33,000	29,900 - 78,000
1992	0.000090 - 0.00810	25,550	227,500	29,000 - 55,000	34,500 - 90,000
1993	0.000100 - 0.00900	17,885	159,250	37,700 - 71,500	34,500 - 90,000
1994	0.000110 - 0.00990	10,220	91,000	43,500 - 82,500	27,600 - 72,000
1995	0.000120 - 0.01080*	7,665	68,250	49,300 - 93,500	23,000 - 60,000
1996	0.000110 - 0.00990	5,110	45,500	52,200 - 99,000	156,400 - 408,000
1997	0.000090 - 0.00810	2,555	22,750	55,100 - 104,500	11,500 - 30,000
1998	0.000080 - 0.00720	-	-	58,000 - 110,000*	11,500 - 30,000
1999	0.000060 - 0.00540	-	-	58,000 - 110,000	4,600 - 12,000
2000	0.000050 - 0.00450	-	-	58,000 - 110,000	-
2001	0.000040 - 0.00360	-	-	58,000 - 110,000	-
2002	0.000030 - 0.00270	-	-	58,000 - 110,000	-
2003	0.000020 - 0.00180	-	-	58,000 - 110,000	-
2004	0.000010 - 0.00090	-	-	58,000 - 110,000	-
2005	0.000003 - 0.00027	-	-	58,000 - 110,000	-
2006	- -	-	-	58,000 - 110,000	-
Totals	0.001 - 0.09	163,520	1.45 M**	58,000 - 110,000	0.368 - 0.960 M**

* denotes peak years

** denotes million

waters surrounding the proposed new platforms. Drilling fluid/cutting discharges will be continuous or bulk. Continuous discharges may come from the solids control equipment on each platform, while bulk discharges (commonly known as active mud discharges or mud tank dumps) are discharges of large volumes of fluids and cuttings (16 to 190 m^3), at rates of discharge (80 to 110 m^3/h) and lasting for a period of 20 minutes to 3 hours (Mors et al., 1982; Petrazzuolo, 1981). Concern has been expressed regarding the effects of drilling muds and cutting discharges on the marine environment. Based on the findings of NAS (1983), Symposium (1980), Neff (1981), Petrazzuolo (1981), Menzie (1982), and others, their results suggest that the environmental risk of exploratory drilling discharges to most OCS marine communities are small. More than 96% of the whole drilling fluids tested in short-term experiments are classified as "slightly toxic" or practically "nontoxic." Toxicity does not seem to be a problem at the concentrations of material found at distances greater than 200-500 m from the discharge point, and not at distances greater than 1,000 m. Much of the toxicity of the mud aqueous faction of drilling fluids appears to be attributable to volatile organic components, which may include petroleum hydrocarbons and by products of lignosulfonate and lignite whereas suspended solids may cause mortality in sensitive species and juveniles by clogging and damaging gill epithelia. Benthic infauna tend to be affected to the greatest extent by offshore drilling waste disposal, but most of the studies suggest that impacts are restricted to an area within 300-500 m of the discharge site. Although dilution is extremely rapid in offshore waters to the extent that every substance measured in the water column, including turbidity, is at background by a distance of 1,000-2,000 m, uncertainties regarding effects still exist for low energy depositional environments which experience large inputs of drilling discharges over long periods of time. For a more detailed discussion of drilling fluid/cutting discharges on the marine environment, see Section IV.A.4.a.

Produced water is by far the largest quantity of waste to be discharged during normal oil and gas operations resulting from the proposed action. The majority of these waters will be discharged directly to the surface waters surrounding the individual platforms; however, in more sensitive areas and in some instances they may be piped ashore and treated for further disposal below ground, on land, or into coastal waters. The effects of produced waters on marine flora and fauna have been examined in laboratory bioassays and several case studies of existing production fields. Concern has been expressed regarding the individual synergistic and antagonistic effects of the various constituents of these waters, but the separation of components effects has not been possible in either case studies or bioassays. In production field case studies, the discharges of other wastes such as drilling fluids and deck drainage has complicated delineation of the source of trace metals and hydrocarbons while there have been no laboratory studies which identify the cause of produced water toxicity. Regional variations in the content of the produced water, as well as temporal changes in its composition during the life of a given well, have also complicated investigations on the effects of this production waste. The published literature indicates that produced waters and brines are only slightly toxic (1%-10%) to practically non-toxic to most marine organisms, using those standards commonly cited for describing acute toxicity (Sprague, 1973 and Day, 1978, both cited in Rose, 1981). The limited toxicity data available for juvenile and larval stages of shrimp and fish suggest, however, that immature individuals may be more sensitive than adults to the effects of produced waters. The sublethal effects of produced waters have also been examined during laboratory and field investigations and generally suggest that detrimental effects would not occur at concentrations of produced waters which could be reasonably expected near the offshore discharge rates (Arctic Laboratories Limited et al., 1983).

In contrast to the lack of laboratory bioassay data, the effects of produced water have been examined in several case studies of offshore production areas; the most detailed of these have been completed in the Gulf of Mexico. Of those conducted within the Gulf, the only significant effects on biota to be documented occurred when produced waters were discharged into shallow bays and estuaries. Mackin (1973) reported that produced water discharges totally destroyed the benthic community within 15 m of the discharges in a shallow (2.4 m) Texas estuary. Some mortality was observed at a distance of 91 m; however, a zone of increased productivity was found from 122 m to several thousand meters from the discharge. Based on studies conducted in Trinity Bay, Texas (Armstrong et al., 1979, cited in Goodman and Troake, 1982) no benthic organisms survived within a 15 m radius of the produced water discharge in water depth of 2-3 m. Low benthic biomass extended to a distance of 150 m from the outfall; no adverse effects were observed at 455 m.

Concentrations of trace metals in produced waters typically exceed those concentrations found in seawater by an order of magnitude or more (Tables IV-30, IV-31, and IV-32). In a review of environmental aspects of produced waters, Koons et al. (1977) cite an increasing body of evidence which indicates that natural processes reduce the activity and toxicities of trace metals dissolved in seawater as a result of binding with organic substances. The low toxicity of trace metals is substantiated by bioassay studies which indicate that most marine organisms tolerate relatively high concentrations of produced waters. However, bioaccumulation of metals and subsequent sublethal effects remain areas of potential environmental concern. The existing data, however, neither confirms nor denies the potential for bioaccumulation of trace metals.

Marine flora and fauna may be affected by several other components and properties of produced waters, including its high salinity, temperature, content of organic compounds, and low DO content; however, all investigators have agreed that rapid dilution and turbulence at the discharge point limit the zone affected by these properties (e.g., Mackin, 1973; Gallaway, 1980; and Bender et al., 1979). Although the distance required prior to the background levels being reached will vary with volume of produced water discharged and its particular characteristics, several investigators suggest that these levels are reached within a few meters from the discharge point, even in relativly shallow waters.

Offshore water quality degradation will occur within the immediate vicinity of exploration and production sites with high impacts expected to occur within a few meters to tens of meters from the discharge source. These impacts, however, will decrease to very low with distance (500-1,000 m) from the source.

Conclusion

The overall impact to offshore water quality is estimated to be low.

Cumulative Impacts

Increased oil/gas exploration and development activities in the Western Gulf will contribute to the cumulative impacts on offshore water quality in this region. These activities, along with ocean dumping and increased vessel traffic, are among the contributions to areawide water quality degradation. For a discussion on other factors considered to cumulatively impact water quality, see Section IV.D.1.a.(3) under offshore water quality, Cumulative Impacts.

Approximately 55 mobile rigs and 256 platforms (multiwell) currently operate in the Western Gulf Federal OCS. The construction of several additional pipelines from existing lease blocks in both Federal and State waters may occur in the future as a result of increased development activities in these areas.

The addition of some 1,220 exploration/delineation wells, 690 development/production wells, 70 platforms, and up to 650 miles of pipelines are estimated for this area as a result of the proposed action and prior OCS sales. This could result in the discharge of up to 0.32 billion bbls of formation waters, 5.54 million bbls of drilling muds, 0.62 million yds^3 of drill cuttings, and an average of 0.29 million gallons/day of treated sanitary and domestic wastes from platforms. Pipeline-related activities could result in the disturbance of some 1.12-2.94 million yds^3 of sediment.

Offshore waters will therefore be subject to cumulative impacts from discharges of drilling fluids, formation waters, and other effluents which add burden of both toxic and nontoxic materials to the water column. However, the natural processes of dispersion, degradation, and sedimentation will result in immeasurably low concentrations of these materials within a few meters to a few kilometers of the discharge site, resulting in low cumulative impacts.

Conclusion

The overall cumulative impacts which include the effects of non-OCS-related factors can be expected to be very high.

(b) Onshore

Impact Analysis

Onshore water quality degradation will occur as a result of increased nonpoint and point sources of pollution, especially in those areas of Texas (Sabine Pass to Lavaca Bay) where water quality problems persist. Impacts to onshore water quality will occur as a result of runoff from construction and operation of onshore facilities supporting expended OCS activities in this region. The construction of up to 60 miles of onshore pipeline will create non-point source increases in surface runoff to nearby streams and rivers. Nonpoint source impacts may be minimized by controlling erosional effects generated within construction site boundaries, with several of the adverse impacts being localized and prevented from having offsite impacts to water bodies in the vicinity of these activities. Any increase beyond normal background levels would be temporary and of a limited duration. Point source increases would also occur from effluent discharges related to OCS-support activities, primarily the discharge of OCS produced waters piped ashore for treatment and discharge; however, any potential adverse impact can be mitigated by Federal and State water pollution control regulations and permitting.

As was shown, produced waters which are piped ashore are subject to treatment prior to discharge, according to Federal and State regulations and permitting requirements. However, it should be noted that this treatment is only used in the extraction of oil and grease contaminants. These waters may therefore contain high concentrations of TDS, oxygen demanding wastes, toxic heavy metals, aromatic hydrocarbons, and environmentally high levels of radionuclides. In open ocean situations the discharge of these components appears to contribute minor impacts to the surrounding discharge area; however, in shallow semi-enclosed estuarine environments, impacts could be extremely high depending on the physical and biological components of each system. Additional information on location of discharge sites, daily discharge rates at each site, and the nature of the environment (background levels, etc.) in each area will be needed to determine the extent of impacts, if any.

Although onshore water quality impacts are estimated to be low, effluents discharged in connection with OCS-support facilities, suggested as having little or no impact, may be extremely damaging when released into sensitive habitats having a reduced capacity for pollution assimilation.

Conclusion

The overall impact to offshore water quality is estimated to be low.

Cumulative Impacts

Increased oil/gas exploration and development activities in the Western Gulf will contribute to the cumulative impacts on onshore water quality in this region. These activities along with current and future activities associated with State tidelands' oil and gas operations, industrial and municipal waste discharges, ocean dumping, and increased vessel traffic are among the contributions to areawide water quality degradation. For a discussion on other factors considered to cumulatively impact water quality, see Section IV.D.1.a.(3) under onshore water quality, Cumulative Impacts.

Approximately 40 platforms (multiwell) are currently operating in the Western Gulf State waters (1985). An unknown number of additional structures may be constructed as a result of resource development in State-owned coastal waters. The construction of several additional pipelines from existing lease blocks in both Federal and State waters may occur in the future as a result of increased development activities in these areas. Pipeline-related activities resulting from prior OCS sales could result in the disturbance of some 1.12-2.94 million yds^3 of sediment.

The addition of some 8 new service bases, 2 new pipe coating yards, 5 new pipeline landfalls, up to 100 miles of pipeline, 1 new platform fabrication yards, and 2 new gas processing plants could result from the proposed action and prior OCS sales in this area. Onshore water quality degradation will occur as a result of increased nonpoint and point sources of pollution associated with construction and operation of this new onshore infrastructure.

Offshore and nearshore waters will therefore be subject to cumulative impacts from discharges of drilling fluids, formation waters, and other effluents which add burden of both toxic and nontoxic materials to the water column. However, the natural processes of dispersion, degradation, and sedimentation will result in immeasurably low concentrations of these materials within a few meters to a few kilometers of the discharge site, resulting in low cumulative impacts.

Conclusion

The overall cumulative impacts which include the effects of non-OCS-related factors can be expected to be very high, primarily in those highly urbanized and industrialized coastal areas currently experiencing water quality problems.

(4) Impacts on Air Quality

For a generic discussion of impacts on air quality, see Section IV.D.1.a.(4).

Impact Analysis

The ambient air quality in the WPA is generally better than the national standards with those exceptions designated as nonattainment areas. Additionally, there are no PSD Class I areas in the Western Gulf. All nonattainment areas in the WPA are identified below:

Cameron, Texas
  Nonattainment - Primary - TSP
Nueces, Texas
  Nonattainment - Primary - TSP and O_x
Galveston, Texas
  Nonattainment - Primary - O_x
Jefferson, Texas
  Nonattainment - Primary - O_x
Brazoria, Texas
  Nonattainment - Primary - O_x
Harris, Texas
  Nonattainment - Primary - O_x, TSP

Onshore, it is expected that no new refineries and no new gas processing plants in the Western Gulf will be needed. Offshore, 320 exploration and delineation wells, 170 development wells and 20 additional platforms will be utilized.

Catastrophic events such as oil spills and blowouts have the potential to create localized air quality problems. Table IV-42 of the Final Regional EIS shows the potential levels of emission due to evaporation from oil spills. As discussed in Section IV.B.3. and as shown in Table IV-20 of the Final Regional EIS, it is expected that approximately 45% of a spill can be lost due to evaporative losses during the first 10 days. In the Western Gulf, one oil spill greater than 1,000 bbls is assumed to occur as a result of Alternative A. Significant degradation of onshore air quality is not expected due to oil spills. If degradation of air quality were to occur in nonattainment or PSD areas, the consequences are assumed to be more serious than if it occurred elsewhere.

Blowouts, also being nonroutine events that may persist for many days, emit substantial levels of THC, NO_x, SO_x, CO, and TSP when associated with fire. These emissions can be considered a point source and have the potential of dispersing over land areas under certain circumstances. This, of course, depends on the location of the event and local wind conditions. Emissions from these sources farther offshore have little potential of degrading onshore air quality; however, if such an event were to persist inshore for some time, it may degrade onshore air quality to an unknown extent. If these events affect any nonattainment or PSD Class I area, the consequences would be more serious than if it occurred elsewhere.

An unflared blowout in an area where sour gas exists could present health hazards with a radius of approximately three miles from the source. Should an event occur, concentrations of H_2S, content of gas, local wind conditions, and other factors would offset the level of impacts of the event. Uncontrolled emissions of this nature are unlikely to cause hazards onshore if the source is further than approximately 4-5 miles offshore. Off Texas, the OCS is over 10 miles from shore.

Catastrophic events are not possible to predict in time and location. Effects from these nonroutine activities are highly dependent on the distance offshore and the proximity to a nonattainment or PSD area and higher impacts will occur if these events affect nonattainment or PSD Class I areas.

Operational emissions from routine offshore activities are typified as to type and amount relative to each activity in Table IV-34. The amount of emissions are the result of assumed conditions stated in the note on this table.

In an attempt to estimate the amount of emissions produced as a result of Sale 105 for a peak year of activity, air emissions data were compiled for exploratory drilling and platform operations. Typical emissions for exploratory drilling are shown in Table IV-35 and are based on studies conducted by USEPA for offshore activities. Emissions for a major platform operation is presented in Table IV-36. Emissions shown in this table are based on five years of air emissions data submitted to MMS in the Gulf of Mexico by industry operations. The most commonly used equipment producing emissions is listed.

Table IV-56 displays estimated air emissions for Sale 105. Assuming the greatest impacts would result during the period of highest activity, estimates are made for the peak year. In addition to emissions for the proposed action (M Scenario), estimates are made for resources expected to be developed (but not currently producing) as a result of prior lease sales. Finally, existing platforms capable of creating air emissions are shown for the WPA with an estimate of emissions. Trends in the number of platforms for the future show a slow decline in the Gulf; therefore, the current number of major platforms is assumed to be the peak year.

A total of estimated emissions resulting from the proposed action and resources expected to be developed from prior sales and existing activities is provided in Table IV-56. The volume estimated assumes all activity occurs in the same peak year. Since it is most unlikely that peak years will be coterminous, this estimate is assumed to be high.

It should be noted that the emission estimated in Table IV-56 are not based on a detailed inventory of emissions. Such an inventory is being developed and when completed will provide a more accurate result. It should also be noted that the cumulative effect of estimated emissions is not presently known. Air quality modeling of offshore conditions will provide information on cumulative effects. This modeling effort is underway.

Specific information on changes in ambient air quality onshore cannot be attained with available information; however, a qualitative assessment of onshore effects can be made. The specific location and density of offshore activity on these areas will ultimately play a large role in determining onshore impacts; these factors are unknown at present. Controls or offsets are not expected to be necessary for offshore facilities.

The proposed action is expected to distribute offshore activity throughout the area. Subplanning area W-3 has the least activity and is a significant distance from, and does not adjoin, any coastal subarea. Subplanning areas W-1 and W-2 have the highest expected activity

Table IV-56

Air Emissions For Peak Years
Western Planning Area
(Tons/Year)

	NO_x	CO	SO_x	VOC	TSP	Wells and Major[1] Platforms
Proposed Action - M Scenario						
Exploratory Drilling	618.0	90.6	41.4	20.4	-	60
Production Drilling	309.0	45.3	20.7	10.2	-	30
Platforms	3,000.0	584.0	8.0	902.0	6.0	20[2]
Total	3,927.0	719.9	70.1	932.6	6.0	
Resources Expected To Be Developed						
Exploratory Drilling	2,389.6	350.3	160.0	78.9	-	232
Production Drilling	1,287.5	188.0	86.3	42.5	-	125
Platforms	2,625.0	511.0	7.0	789.0	5.5	18[3]
Total	6,302.1	1,049.3	253.3	910.4	5.5	
Existing Platforms	19,200.0	3,737.6	51.2	5,772.8	38.4	128[3]
Cumulative Total	29,429.1	5,506.8	374.6	7,615.8	49.9	

[1] A major platform is one that has equipment capable of producing emissions.

[2] Assumes all platforms will be major.

[3] Assumes 50% of all platforms will be major.

offshore and are located adjacent to land areas. In subplanning areas adjacent to coastal areas, the activity ranges to a maximum of 186 exploration and delineation wells, 105 development wells, and 12 platforms in subplanning area W-2. Subplanning area W-1 is expected to have 90 exploration and delineation wells, 42 development wells, and 5 platforms.

Of the coastal counties adjacent to offshore areas where the majority of development will occur, the ones most likely to be adversely impacted by this activity due to their unique status as nonattainment areas are Cameron, Nueces, Galveston, Harris, Jefferson, and Brazoria Counties, Texas. There are no Class I PSD areas in the WPA.

The expected level of offshore activities adjacent to the above counties is low. The maximum activity occurs in subplanning area W-2 with 12 platforms expected. Due to the low level of expected activity resulting from this proposal, the impacts from operational emissions are also expected to be low.

Additionally, no significant degradation of onshore air quality is expected from routine offshore operational emissions due to the regulatory control provided in 30 CFR 250.57. These regulations limit emissions from OCS facilities relative to significant levels outlined in Tables IV-29 and IV-40 of the Final Regional EIS. These regulations insure that impacts do not rise above some upper level (moderate) to be considered significant impacts. Impacts are controlled by regulation in this case such that public health and welfare are protected at an acceptable level. Impacts from uncontrolled events could be higher. The expected duration of impacts and a summary of expected impacts on the resource or concern are presented in Table IV-57.

Conclusion

The overall impact on coastal air quality from the proposed action is expected to be moderate in any nearby coastal area where an uncontrolled sour gas blowout occurred. Low impacts are expected in Cameron, Nueces, Galveston, Jefferson, and Brazoria Counties, Texas. Very low impacts are expected throughout the remainder of the coastal area of the Western Gulf.

Cumulative Impacts

Presently, there are estimated to be 71 gas processing plants and 37 refineries in the Western Gulf distributed throughout coastal subareas W-1 and W-2. In addition to existing gas processing plants, it is estimated that 0-2 new plants may be required as a result of prior leasing activities. No new oil refineries are projected for the WPA. It is assumed that new source performance standards and best available control technology will be utilized on all facilities. Also, it assumed that additional controls or offsets may be required in some areas to meet air quality standards imposed by existing regulations. It can be assumed that impacts will be their highest (relatively) in the following counties which are classified as nonattainment areas: Cameron, Nueces, Harris, Galveston, Jefferson, and Brazoria Counties, Texas.

It should be noted that these identified nonattainment areas are classed as such for specific pollutants (TSP and O_x). Gas processing produces specific SO_x emissions only. Therefore, these activities will not be a significant threat to the identified counties except that these activities may use a substantial increment of the allowable SO_x limit.

Offshore infrastructure in the WPA is estimated to be 256 platforms and 1,695 production wells as a result of leasing activity through 1983. Emissions from OCS installations is calculated at the time of permitting production facilities. Such factors as the distance to shore, climatological conditions, and emission producing equipment on each platform are analyzed as to their contribution to the degradation of air quality. Since records have been kept (June 1980), this air quality permitting analysis has identified a negligible contribution in the WPA.

Point source emissions from onshore activities, such as non-OCS oil and gas processing, power generation facilities, industrial processing or manufacturing facilities, waste incineration facilities, petrochemical storage facilities and mobile emissions sources (automobiles, waterborne transportation, etc.), are expected to increase at rates in proportion to the growth of population. Energy conservation, improved automobile emission controls, alternative (non-fossil

Table IV-57

Summary of Expected Impacts on Air Quality-Proposed Action Western Planning Area

Major Impact Producing Factor	Expected Impacts Onshore	Duration of Expected Impacts (if applicable)
Offshore Activity		
Catastrophic Events		
Blowouts with fire	Low to moderate	Short-term (less than 1 year)
Oil spills (major)	Low to moderate	Short-term (less than 1 year)
Release of sour gas (nonflared blowout)	Moderate	Short-term (less than 1 year)
Operational Emissions		
Exploration Drilling	Low*	Long-term (more than 3 years)
Platform installation	Low*	Long-term (more than 3 years)
Development drilling	Low*	Long-term (more than 3 years)
Oil production	Low*	Long-term (more than 3 years)
Gas production	Low*	Long-term (more than 3 years)
Barge loading	Low*	Long-term (more than 3 years)
Onshore Activity		
Operational Emissions		
Refineries	No new expected*	Long-term (more than 3 years)
Gas processing plants	No new expected	Long-term (more than 3 years)

*Impacts from these activities are maintained below an upper limit (moderate) due to standing regulatory controls.

Note: Specific changes in conditions relative to levels of impacts are defined at the beginning of this section.

fuels) energy generation facilities, and new waste disposal technology are factors that will determine the rate of change in air quality. Due to populaton in-migration throughout the Gulf region, the ambient air quality will probably degrade, over time, due to the overall effects of these activities and OCS-related activities. Ambient air quality is not expected to degrade beyond attainment standards where it is currently better than those standards or where PSD areas are located. The effects of all emissions on areas presently classified as nonattainment will be reduced over time so that attainment standards will be met. Controls or offsets may be applied to emission sources to meet these standards.

Conclusion

The overall cumulative impacts will be moderate.

(5) Impacts on Endangered and Threatened Species

An endangered species consultation pertaining to proposed Gulf of Mexico OCS oil/gas lease sales was held with FWS and NMFS. The biological opinions from these agencies (Appendix C) indicate that leasing and exploration activities associated with the proposed action are not likely to jeopardize the continued existence of the listed species considered in the consultation or result in the destruction or adverse modification of their critical habitat. The definitions of impact levels for endangered species are listed in Table S-4.

Of the endangered and threatened species discussed in Section III.B.3, loggerhead and Kemp's ridley turtles, and brown pelicans are probably the species more vulnerable to OCS-related impacts resulting from the proposed action. The endangered whale species which occur in the WPA are not likely to be impacted by OCS oil and gas activities because they are only occasionally sighted in areas where OCS-related oil/gas activities occur, they are few in number (Fritts et al., 1983), and no adverse impacts to whales have been reported or documented from OCS-related activities in this area.

(a) Sea Turtles

Impact Analysis

Loggerhead, green, leatherback, hawksbill, and Kemp's ridley turtles occur in the proposed sale area and loggerhead and ridley turtles occasionally nest on South Padre Island, Texas (Visual No. 3). Sea turtle nesting in the Western Gulf area occurs from April-August with peak nesting in June.

The major impact producing factors which could potentially affect sea turtles in the WPA include OCS-related oil spills, collision with OCS-related support vessels, and OCS-related pipeline construction across turtle nesting beaches. Oil spills contacting a turtle nesting beach during egg incubation or hatching periods (July-August) could cause significant turtle mortality (Fritts and McGhee, 1981). Offshore oil spills could have a serious impact on sea turtles, especially juvenile turtles. Floating oil could increase the mortality of turtles by contacting the turtles when they surface to breathe and indirectly by affecting food sources.

Recently, some NMFS head-started Kemp's ridley turtles released off Padre Island, Texas, were washed onshore dead from oil/tar ball contamination. Chemical analysis of the oil indicated a foreign crude oil source. One large spill (1,000 bbls or greater) contact and several smaller spill contacts are assumed with sea turtle nesting habitat along the Texas coast. Such spill contacts could adversely affect sea turtle nesting areas; the level of expected effect is considered to be very low. With a very low possibility of oil spill occurrence and contact, it is unlikely that the proposed action would have an adverse impact on sea turtles along the Western Gulf coast.

As a result of the proposed action, OCS-related vessel traffic in the Western Gulf is estimated to increase less than 2%. The level of vessel collisions with sea turtles in the

Western Gulf is unknown; however, no injuries or mortalities have been reported or documented. The level of impact to sea turtles resulting from OCS-related vessel collisions in this area is expected to be very low.

No projected pipeline construction is expected to occur in the vicinity of sea turtle nesting beaches in the Western Gulf as a result of the proposed action.

Conclusion

A very low level of impact on sea turtles from potential OCS-related oil spills, collisions with OCS-related support vessels, and pipeline construction is expected in this area as a result of the proposed action.

Cumulative Impacts

In addition to the impacts discussed previously for the proposed action, impacts from existing Federal OCS oil/gas leases and activities; existing oil/gas leases and activities in State tidelands; tankering of petroleum products and foreign crude oil; and other commercial, military, and recreational offshore and coastal activities should be considered as cumulative impacts.

One large spill (1,000 bbls or greater) contact and several smaller spill contacts are assumed with sea turtle nesting beaches under the cumulative scenario. An unknown number of oil spills could result from oil development in the Texas tidelands. Also, oil/tar balls from natural seeps, bilge cleaning, and foreign oil spills impact the Texas coastal area. The cumulative impact of oil spill contacts and other oil contamination in the WCA is expected to result in a moderate level of impact on marine turtles.

Collisions of OCS-related support vessels with sea turtles could occur in Texas coastal areas; the frequency of collisions has not been documented and is believed to be infrequent. OCS-related vessel traffic is about 5% of the commercial and recreational vessel traffic in Texas waters.

Impacts to sea turtles from OCS-related coastal development and support facilities are not expected as the majority of these facilities are already established. A few pipelines/gas processing facilities and service bases may be required but these are unlikely to impact sea turtle nesting/feeding areas. The cumulative impact of OCS-related facilities in the WPA are expected to result in a low level of impact on marine turtles.

Impacts that are unrelated to OCS activities but contribute to the major cumulative impact on sea turtles include: the loss of nesting beaches to commercial, recreational, and residential development along Texas beaches; high to moderate mortality caused by commercial trawling; natural and man-induced predation of turtles and eggs on nesting beaches throughout the Gulf and Caribbean regions; oil/tar balls from natural seeps, bilge cleaning, and tanker spills; compaction of beach areas by vehicles and beach cleaning equipment; incidental capture by commercial longline fishing gear and entanglement in crab pot lines; dumping of contaminated wastes and plastic materials into coastal waters; and collision with commercial and recreational vessels.

Conclusion

As a result of the proposed action and other activities, the overall cumulative impact on sea turtles in the Western Gulf is estimated to be high.

(b) Brown Pelicans

Impact Analysis

There are about 2-4 nesting colonies of brown pelicans along the Texas coast. The major breeding population nests at Pelican Island in Corpus Christi Bay; other colonies nest at

Deadman's Reef north of Rockport, Long Reef in Aransas Bay, and Caroll Island in San Antonio Bay (Visual No. 3). The Texas population of brown pelicans is about 115 nesting pairs.

The major impact producing factors which could potentially affect brown pelicans in the WPA include OCS-related oil spills, disturbance from aircraft, boat, and vessel traffic, and onshore facility construction.

Brown pelicans are susceptible to oil spills because as they plunge-dive for fish their feathers could be coated with oil. This may contribute to direct mortality or could result in a secondary impact of reduced hatchability of eggs that may become oiled by contaminated adult birds.

One large spill (1,000 bbls or greater) and several smaller spill contacts are assumed with brown pelican nesting habitat along the Texas coast. Such spill contacts could adversely affect the nesting habitats. The expected impact is estimated to be very low.

The pelican is susceptible to disturbance and habitat alteration of nesting areas; this may cause nest desertion and egg losses. As a result of the proposed action, aircraft and vessel traffic in the Western Gulf is estimated to increase less than 3%.

No onshore facility construction is expected to occur in the vicinity of brown pelican nesting habitat in the Western Gulf as a result of this proposal. It is unlikely that coastal construction will impact brown pelican nesting areas.

Conclusion

A very low level of impact on brown pelicans from potential OCS-related oil spills, aircraft/vessel traffic, and coastal construction is expected in the WPA as a result of the proposed action.

Cumulative Impacts

In addition to the impacts discussed previously for the proposed action, impacts from existing Federal OCS oil/gas leases and activities; existing oil/gas leases and activities in State tidelands; tankering of petroleum products and foreign crude oil; and other commercial, military, and recreational offshore and coastal activities should be considered as cumulative impacts.

Two large oil spill (1,000 bbls or greater) and a number of smaller spill contacts are assumed with brown pelican nesting areas. In addition, oil/tar balls from natural seeps, bilge dumping, and foreign oil spills could also impact brown pelicans. The expected cumulative impact of oil spill contacts and other oil contamination on brown pelicans is estimated to be high.

Disturbance from aircraft, boat, and vessel traffic in the vicinity of pelican nesting areas near Corpus Christi, Texas, and feeding areas along the Texas coast is not likely to increase above current levels as a result of OCS oil/gas activities. About 90% of the aircraft, boat, and vessel traffic in this area is non-OCS-related, such as: commercial tanker/cargo vessels; commercial and recreational fishermen; intracoastal tug and barge traffic; maintenance dredging; and commercial and private aircraft.

Impacts to brown pelicans from OCS-related onshore development and support facilities are not expected to increase much above current levels to handle cumulative OCS oil/gas resources. A few additional pipelines and gas processing facilities and service bases may be required; however, the majority of OCS-related onshore facilities are already established.

Impacts that are unrelated to OCS activities but contribute to the major cumulative impact on brown pelicans would include the loss of habitat to commercial, military, recreational, and residential development in the coastal zone; dredging and draining of wetland and coastal feeding areas; high levels of oil and organic chemical contamination of coastal water and food sources by agricultural runoff and industrial wastes; the disturbance from aircraft, boat, and vessel traffic in nesting and feeding areas; entanglement in commercial and recreational fishing gear; and flooding of nesting areas.

Conclusion

As a result of the proposed action and other activities, the overall cumulative impact on brown pelicans in the Western Gulf is expected to be high.

(6) Impacts on Marine Mammals

Impact Analysis

Of the marine mammals discussed in Section III.B.4., the bottlenose dolphin is probably the non-endangered marine mammal most likely to be affected by OCS-related oil/gas activities based on their population and nearshore habitat (Fritts and Reynolds, 1981; Schmidly, 1981). Potential impacts on whales are discussed in Section IV.D.1.a.(5).

The major impact producing agents which could potentially affect marine mammals include: OCS-related oil spills, collision with OCS-related support vessels, and disturbance from offshore activities. See Table S-4 for definitions of impact levels.

Some members of localized populations or subpopulations of bottlenose dolphins could be adversely affected by oil spills in bays or harbor areas. Dolphins have been observed swimming and feeding in oil slicks and oil apparently does not adhere to their smooth skin (Geraci and St. Aubin, 1982). It is unlikely that dolphins would inhale oil into their blowhole while breathing. Some hydrocarbon contaminated food or water could be ingested; however, the effects of hydrocarbon ingestion by marine mammals is unknown.

One large spill (1,000 bbls or greater) and several smaller spill contacts are assumed with nearshore habitats of marine mammals. Such spill contacts are expected to have a very low level of impact on the marine mammal population.

As a result of the proposed action, vessel traffic in the WPA is estimated to increase less than 2%. The level of vessel collisions with marine mammals in the Western Gulf is unknown; however, no injuries or mortalities have been reported or documented in the Gulf of Mexico region. The level of impact to marine mammals resulting from OCS-related vessel collisions in this area is expected to be very low. About 490 wells will be drilled, and some seismic exploration will be required over the assumed 18- to 20-year period of this proposal. The effect of this disturbance to marine mammals is unknown; however, because it is usually short-term and fairly localized, it is unlikely to cause a major impact on marine mammals in the WPA as a result of the proposed action.

Conclusion

It is expected that OCS-related oil spills, collisions with OCS-related vessel traffic, and disturbance from OCS-related oil/gas activities will have a very low level of impact on marine mammals and their habitat in the Western Gulf as a result of the proposed action.

Cumulative Impacts

In addition to the impacts discussed previously for the proposed action, impacts from existing Federal OCS oil/gas leases and activities; existing oil/gas leases and activities in Texas tidelands; tankering of petroleum products and foreign crude oil; and other commercial, military, and recreational offshore and coastal activities should be considered as cumulative impacts.

Four large spill (1,000 bbls or greater) contacts and a number of smaller spill contacts are assumed with nearshore habitats of marine mammals. In addition, natural oil seeps, bilge cleaning, and foreign oil spills could have adverse cumulative impacts on marine mammals, and deepwater oil/gas exploration and development on the continental slope could effect sperm whales which feed on squid in deepwater areas. The expected cumulative impact of these factors on the marine mammal population is estimated to be moderate.

The OCS-related boat and vessel traffic for the proposed action is less than 2% of the existing commercial, military, and recreational vessel traffic in the offshore areas inhabited by marine mammals. About 259,000 vessel trips of all types were recorded for the WPA in 1981. Seismic exploration will occur on additional lease blocks, and sound will be generated by 30 offshore platforms and numerous supply/crew boats and aircraft. Additional sound is produced by commercial, military, and recreational vessels and aircraft and by commercial and military sonar. The majority of these disturbances and noises are generally localized around the source and fairly short-term in duration. Cumulative impacts from disturbances and noises in the Caribbean Sea and Atlantic Ocean could also occur. The cumulative impact from these disturbances and noises on marine mammals are expected to be low in the WPA.

Impacts that are unrelated to OCS activities but could contribute to a cumulative impact on marine mammals include: commercial and subsistence hunting of whales; entrapment, injury, and mortality in fishing gear and underwater cables; and ocean disposal of chemicals, radioactive wastes, munitions, etc., in deepwater areas.

Conclusion

As a result of the proposed action and other activities, the overall cumulative impact on marine mammals in the Western Gulf is expected to be low.

(7) Impacts on Coastal and Marine Birds

Impact Analysis

The major impact producing agents which could potentially affect coastal and marine birds as a result of the proposed action include OCS-related oil spills, disturbance from onshore facility construction near coastal nesting areas, and displacement of birds from feeding and nesting areas due to increased air and vessel traffic. See Table S-4 for definitions of impact levels. Many of the coastal and marine birds in the WPA, which are susceptible to oil spills, are migratory and could be exposed to oil spills during their overwintering period (October-March).

Oiling of birds causes death from hypothermia, shock, or drowning; oil ingestion significantly reduces reproduction in some birds; and oil contamination of eggs by oil-fouled adult birds reduces hatchability. Indirect effects of oil pollution on birds include contamination, displacement, and reduction of food sources. Long-term contamination of food sources and habitats may cause chronic toxicity to birds through the accumulation of hydrocarbon residues and may affect their behavior, physiology, and reproduction.

Aerial surveys along the Texas coast during the Ixtoc I oil spill in 1979 found that the reduction in bird population during the period of oil impact was due to the birds' abandonment of polluted beaches rather than to bird mortality, since the population returned to normal levels soon after a tropical storm removed most of the oil from the beaches (USDC, NOAA, 1982). During the Ixtoc I spill, Chapman (1979) observed royal terns sitting along the high tide line on Texas beaches that were heavily oiled.

One large spill (1,000 bbls or greater) and several smaller spill contacts are assumed with nesting and feeding areas of coastal and marine birds. Such spill contacts could cause disturbances and other adverse effects.

Disturbance of coastal and marine birds nesting and feeding habitat from onshore construction and associated noise from air and vessel traffic could result in a reduction or elimination of birds that use the habitat for feeding or nesting. Dredging and the construction of pipelines and roads could change water flows that may result in complete conversion of a marsh ecosystem (Section IV.D.1.a.(1)).

It is estimated that one gas pipeline and processing plant (requiring a maximum of about 280 acres) could be constructed in the vicinity of Matagorda, Brazoria, Galveston, Chambers, or Jefferson Counties in Texas that may affect coastal and marine bird habitat in that area (Section

IV.A.1.e.). This assumed pipeline facility will probably be located in a developed onshore area, and it is unlikely that it will affect coastal and marine habitat.

Conclusion

A very low level of impact on coastal and marine birds from potential OCS-related oil spills and disturbance from onshore construction is expected in the Western Gulf as a result of the proposed action.

Cumulative Impacts

In addition to the impacts discussed previously for the proposed action, impacts from existing Federal OCS oil/gas leases and activities; existing oil/gas leases and activities in State tidelands; tankering of petroleum products and foreign crude oil; and other commercial, military, and recreational offshore and coastal activities should be considered as cumulative impacts.

Four large spill (1,000 bbls or greater) contacts and a number of smaller spill contacts are assumed with the nesting and feeding areas (nearshore and coastal) of coastal and marine birds. Galveston Bay and Anahuac National Wildlife Refuge is located in the potentially affected area. Galveston Bay is an important feeding, nesting, and overwintering area for bird species such as: Forster's and least terns, roseate spoonbills, reddish egrets, and 25 species of overwintering waterfowl and one of the largest laughing gull colonies along the north Texas coast. Anahuac National Wildlife Refuge is the location of the largest group of endangered red wolves in existence. The endangered peregrine falcon and eskimo curlew migrate through this area. Coastal and marine birds that migrate through more than one OCS planning area may also be exposed to oil spills in other areas. The expected level of cumulative impact on coastal and marine birds due to these spill contacts is estimated to be moderate.

Disturbance from OCS-related aircraft, boat, and vessel traffic in the vicinity of bird nesting and feeding areas in the WPA is not expected to increase above current levels. About 90% of the aircraft and vessel traffic in this area is non-OCS-related, and as foreign crude oil imports increase there could be increased disturbance to bird colonies in this area.

Cumulative impacts from OCS-related onshore development and support facilities are not expected to increase much above current levels, as most OCS-related facilities are already established. A few additional gas pipelines/processing plants and service bases may be required along the WPA coast.

Impacts that are not related to OCS activities but could contribute to the major cumulative impact on coastal and marine birds would include the loss of nesting and feeding habitat to commercial, military, recreational, and residential construction; potential construction of offshore oil ports or deepwater marine terminals; dredging and draining of wetland areas along migratory flyways and in coastal feeding and overwintering areas; high levels of oil/tar balls from natural seeps, municipal runoff, bilge cleaning, and foreign oil spills; entanglement in commercial and recreational fishing gear; and flooding of nesting areas. Agricultural runoff and industrial organic chemical wastes could cause direct mortality or indirectly cause the loss of food sources for avian species.

Conclusion

As a result of the proposed action and other activities described above, the overall cumulative impact on coastal and marine birds in the Western Gulf is expected to be moderate.

(8) Impacts on the Commercial Fishing Industry

For a generic discussion of impacts on fisheries resources, see Section IV.D.1.a.(8).

Impact Analysis

From 1977-1981 approximately 179.9 million lbs/yr of finfish and shellfish with a dockside value of $148.8 million were caught in the Western Analysis Area (Table IV-58).

Subanalysis area W-1 provides approximately 31.4 million lbs/yr of commercial fisheries catch valued at about $68.8 million. These figures represent about 17% and 46%, respectively, of the commercial fisheries catch and value for the Western Analysis Area. The inshore portion of this analysis area provides about 11.6 million lbs/yr of commercial fisheries catch worth $9.3 million. Five platforms/structures are expected under Alternative A, eliminating less than 0.1% (15-25 acres) of the trawling area. There are no open bays in this analysis area to be impacted by an oil spill.

Subanalysis area W-2 provides approximately 148.5 million lbs/yr of commercial fisheries catch valued at $80 million. These figures represent about 83% and 54%, respectively, of the commercial fisheries catch and value for the Western Analysis Area. The inshore portion of this analysis area provides about 18.6 million lbs/yr of commercial fisheries catch worth $17.5 million. Twelve platforms/structures are expected under the proposed action, eliminating less than 0.1% (36-60 acres) of the trawling area. There are almost 300,000 acres of open bays in this analysis area. One large spill (1,000 bbls or greater) contact and several smaller spill contacts are assumed for analysis with this open bay area (which contains finfish and shellfish nursery/spawning grounds). The large spill contact could result in severe medium term (1-3 years) effects on fisheries; the smaller spill contacts are expected to cause localized short-term effects (with recovery likely to occur within one year).

Subanalysis area W-3 provides virtually no commercial fisheries catch; therefore, the three production platforms expected for the proposed action would not remove any trawling area. There are no open bays in this analysis area to be impacted by an oil spill.

Twenty platforms/structures are expected in the WPA under the proposed action, eliminating less than 0.1% (60-100 acres) of the trawling area. Fishermen would absorb some economic loss through gear conflicts. One large spill (1,000 bbls or greater) occurrence is assumed. This spill could destroy some fish eggs, larvae, and juveniles and disrupt fishing if the spill occurs in close proximity to a localized fishing area.

Conclusion

A moderate impact is expected on the commercial fishing industry from the proposed action.

Cumulative Impacts

In addition to the 20 platforms projected for the Western Gulf from the proposed action, another 50 are expected to result from lease sales held in the recent past. The total area lost to trawling (210-350 acres) would still represent less than 0.1% of the total planning area.

One large spill (1,000 bbls or greater) contact and a number of smaller spill contacts with Galveston Bay (W-2) and with the Vermilion/Atchafalaya Bay areas (C-1 and C-2) are assumed as a result of Federal OCS and other activity under the Cumulative Scenario. The commercial catch in W-2 is approximately 148.5 million lbs/yr worth $80 million and C-1 and C-2 represent 568.0 million lbs/yr worth $77.0 million and 378.1 million lbs/yr worth $95.5 million, respectively. A large spill contacting these areas could result in severe medium-term (1-3 years in duration) consequences on invertebrate and vertebrate fisheries and could deter fishing; the smaller spill contacts are expected to cause localized short-term effects (with recovery likely within one year).

Commercial fisheries in the Gulf of Mexico are also impacted by activities and events other than the oil and gas industry. Competition between large numbers of commercial fishermen, commercial operations employing different fishing methods, and commercial and recreational fishermen for a given fishery resource may reduce standing populations. Also, fishing techniques which may take significant numbers of other species as by catch, such as trawling or gill netting,

Table IV-58

Commercial Fisheries Resources and Impact Producing Factors
Western Gulf of Mexico

		Resources			Impact Producing Factors								
					Number of Assumed Large Spill Contacts[1]					Offshore Production Platforms (number)			
Analysis Area*	County	Annual Landings (million lbs)	Annual Landings (million $)	Open Bay (acres)	M Scenario[1]	High Scenario	T Scenario[2]	Cumulative Scenario	Low Scenario	M Scenario	High Scenario	T Scenario	Cumulative Scenario
W-1		31.4	68.8	-	1	1			2	5	7	92	30
	Cameron			-	0	0	1	1					
	Willacy			-	0	0	1	1					
	Kenedy			-	0	0	1	1					
	Kleberg			-	0	1	1	1					
	Nueces			-	1	1	1	1					
	Aransas			-	0	0	1	1					
	Calhoun			-	0	1	1	1					
W-2		148.5	80.0	285,355	1	1			3	12	19	146	30
	Matagorda			-	1	1	1	1					
	Brazoria			-	1	1	1	1					
	Galveston, Chambers, Harris (Galveston Bay)			285,355	1	1	1	1					
	Jefferson			-	0	0	1	1					
W-3		-	-	-	-	-	-	-	1	3	4	52	10

*See Figure IV-1.

[1] Oil spills of 1,000 bbls or greater occurring and contacting indicated targets within 10 days (Section IV.A.5., Table IV-16). One spill contact is also assumed with the Vermilion/Atchafalaya Bay area under the Cumulative Scenario.

may reduce the standing populations of these as well as the desired species. In the Western Gulf, populations of red snapper and other reef fish appear to be declining, particularly nearshore, primarily due to fishing pressure from hook-and-line fishermen. Overfishing and taking of juveniles, as by catch in trawling operations, are also impacting red drum populations in Texas. Space use conflicts can also result from different forms of commercial operations and between commercial and recreational fisheries. Trawling and crabbing operations often lead to this type of conflict resulting in loss of fishing space or gear conflicts. Also, the loss of wetlands are being closely studied to determine in what way and to what extent this loss affects commercial fisheries.

Conclusion

The impacts resulting from the proposed action, plus the effects of these other factors, added to the widely varying baseline conditions resulting from natural environmental factors, may result in a high cumulative impact on the commercial fishing industry.

(9) Impacts on Offshore Marine Recreational Fishing

Section IV.D.1.a.(9) presents an extensive general discussion on the interaction between fishing and offshore oil and gas production and established standards for judging the level of impact likely to result from OCS lease sales.

Impact Analysis

Table IV-40 presents the total number of existing petroleum structures (de facto reefs) and designated artificial fishing reefs in the Western Gulf, and the expected number of platforms (20) likely to result from Sale 105. Not reflected in this table are the number of platforms likely to be removed in the future or the number yet to be added from former sales. Many more structures are being added in the Western Gulf than are being removed currently. However, some structures important to fishing such as the 15 remaining structures in the Buccaneer field are likely candidates for removal in the next few years. Unless one or more of the 20 structures likely to result from Sale 105 is located within 25 miles of Galveston, Freeport, Port Aransas, Port Isabel, or Port Lavaca, there is unlikely to be an appreciable impact on recreational fishing.

One large oil spill (1,000 bbls or greater) contact is assumed with marshes or seagrass beds along the Texas coast as a result of the proposed action. Galveston Bay and associated marshes are most vulnerable (7% probability). Such a spill would destroy some fish eggs and larvae but is unlikely to be detected by the recreational fishermen in terms of fishing success in future years. Furthermore, oil spills will temporarily remove a portion of the affected area (slick area) from sports fishing activity. Should a spill occur during a major fishing tournament, the impact would be made severe depending on the size, timing, and location of the slick.

Conclusion

The proposed action is expected to have a very low positive impact on marine recreational fishing in the Western Gulf.

Cumulative Impacts

Past, as well as currently proposed, leasing on the OCS could contribute up to 70 new offshore high profile, de facto artificial reefs in the Western Gulf. These structures would add to the existing 450 de facto artificial fishing reefs and 8 permitted fishing reefs (additional permits pending) already in the Western Gulf of Mexico. Studies and observations have shown that where oil and gas structures are accessible they are significant attractants of offshore fishermen and enhance fishing success (recreational as well as commercial). Considering greater interest in artificial reef development in Texas, Florida, and Alabama, and an expanding offshore fishing population in general, more interest in the retention and reuse of obsolete oil and gas structures as dedicated reefs is likely Gulfwide. Conversely, pollution and activity associated with the works of man (such as oil and chemical spills, tributary modifications, competition between commercial and recreational fishermen and among recreational fishermen, coastal modifications brought on by industrial development and population increases in the coastal zone, and inevitable natural forces such as subsidence, anoxia, floods, and freezes) will affect long-term sociological and ecological change which will indirectly stress fishery resources important to marine recreational fishermen and lead to the increase of restrictive regulations affecting fishing enjoyment and participation. Offshore oil spills related to Federal and State oil and gas development, and the tankering of crude oil imports in the Gulf of Mexico will contribute to the environmental stress affecting fishery resources in the WPA.

Conclusion

The estimated level of cumulative impacts on offshore marine recreational fishing in the Western Gulf is expected to be moderate.

(10) Impacts on Major Shorefront Recreational Beaches

Section IV.D.1.a.(10) presents a general discussion establishing large oil spills (greater than 1,000 bbls) and chronic debris as the major threats to use and appreciation of recreational beaches exposed to Gulf of Mexico OCS leasing and development. Standards for judging the level of impact likely to result from OCS lease sales are also listed in Section IV.D.1.a.(10).

Impact Analysis

It is reasonable to expect that exploration and production on blocks leased in the Western Gulf of Mexico under the proposed action could lead to large oil spills, and these spills could be carried by wind, wave, and currents to interact with a major shorefront recreational beach in Texas (Table IV-10).

One large oil spill (1,000 bbls or greater) contact is assumed with land as a result of the proposed action. This spill contact could occur with one of three land segments (counties) in Texas containing major recreational beaches (Nueces, Brazoria, and Galveston Counties). Galveston beaches such as Stewart Beach, West Beach, or Galveston Beach are the most vulnerable. A number of smaller spills also occur and contact recreational beaches. As was noted from the Ixtoc and the Alvenus experiences such an interaction will lead to temporary beach closures (2-4 weeks), sand removal, displacement of recreational activity, and economic consequences which will directly affect the businesses and support services directly associated with the beaches impacted, and it can indirectly spread to the community if the spill effects and publicity persist or occur during peak season (Sections IV.D.1.a.(12) and IV.D.2.a.(12)). Offshore operations associated with exploration, development, and production of leases granted will result in some flotable trash and debris entering the Gulf, which is likely to effect beach aesthetics and increase maintenance requirements.

Conclusion

The proposed action is estimated to have a low impact on the quantity, quality, and use of major shorefront recreational beaches along the Texas coast.

Cumulative Impacts

Two large oil spill (1,000 bbls or greater) contacts and a number of smaller spill contacts are assumed with major recreational beaches in Texas under the Cumulative Scenario. Such spill contacts and industrial litter from offshore operations in the Western Gulf are expected to impact Texas recreational beaches. Consequently, there could be short-term disturbance causing temporary loss or displacement of water-related, nearshore recreational activity and associated economic activity on specific beaches actually impacted (Galveston Island, Padre Island Natural Seashore, and Mustang Island State Park). Continued and expanded oil and gas operations in the Western and Central Gulf will contribute to an already serious problem of human and industrial debris on coastal shorefronts which detracts from the aesthetic quality of recreational beaches and increases the cost of beach maintenance programs. Other factors such as oil and gas development in Mexican waters, in State territorial waters, offshore commercial and recreational fishing, commercial shipping and fishing, as well as recreational use of beaches themselves and natural causes, also contribute to the debris problem and oil spill risk currently existing on the major recreational beaches of the WPA. A recent analysis of 149 drums floating ashore during an 11-month period along approximately 100 miles of South Texas beachfront focused on Padre Island National Seashore indicates hazardous chemicals are a threat to the health and safety of beach use as well. Cleanup cost to remove trash and debris from south Texas beaches is estimated to exceed a million dollars a year. The contribution to the trash and debris problem from OCS leasing is unknown but is considered major and increasing.

Conclusion

Overall, the estimated level of cumulative impact on Texas' major shorefront recreational beaches is expected to be high.

(11) Impacts on Cultural Resources

For a generic discussion of the impacts on cultural resources, see Section IV.D.1.a.(12).

(a) Historic

Impact Analysis

Offshore development as a result of the proposed action could result in an interaction between a drilling rig, platform or pipeline or anchors, and an historic shipwreck. This direct interaction with a shipwreck site would destroy fragile ship remains such as the hull, and wooden or ceramic artifacts, and would disturb the context of the entire site. The result would be the loss of archaeological data on ship construction, cargo, and social organization of the vessel's crew, and the concomitant loss of information on maritime culture for the time period from which the ship dates.

If it is assumed that some shipwrecks in the Western Gulf contain unique information on ship construction and on maritime culture and that others contain information available from other sources, the impact, should an interaction occur, would be moderate to very high (depending on the uniqueness of the data lost).

For each subplanning area in the WPA, Table IV-59 shows the percentage of blocks which fall within cultural resources Zone 1 (Visual No. 11), where there is a high probability for the occurrence of shipwrecks. Using this percentage, the number of exploration and delineation wells, platforms, and miles of pipeline which would occur within Zone 1 as a result of the proposed sale were calculated. These potential interactions with historic resources were then totaled. Based on these figures, the risk of impacts occurring to historic shipwrecks as a result of offshore development from Sale 105 would be low. Therefore, although the impact to historic sites in the Western Gulf, should an interaction occur, would be moderate to very high, considering the low risk for an interaction occurring, the expected impact would be low to moderate.

Onshore development as a result of the proposed action could result in an interaction between construction of new onshore facilities and an historic site. This direct interaction with an historic site would cause physical damage to, or complete destruction of, historic sites,

Table IV-59

Estimated Risk of Impacts Occurring to Cultural Resources
Western Gulf (Sale 105)

Subarea	Approximate Number of Blocks	Number of Blocks Within Cultural Resources Zone 1		Number of Blocks Within Cultural Resources Zones 1 & 2		Exploration & Delineation Wells		
			%		%	Total	Zone 1	Zones 1 & 2
W-1	2,351	62	3	491	21	90	3 (3%)	19 (21%)
W-2	2,739	498	18	853	31	186	33 (18%)	58 (31%)
W-3	1,237	0	0	0	0	44	0 (0%)	0 (0%)
Totals	6,327	560	-	1,344	-	320	36	77

Subarea	Platforms			Miles of Pipeline*			Total of Possible Interactions in Zone 1	Possible Interactions in Zone 1 after Applying Lease Stipulation		Total of Possible Interactions in Zones 1 & 2	Possible Interactions in Zones 1 and 2 after Applying Lease Stipulations
	Total	Zone 1	Zones 1 & 2	Total	Zone 1	Zones 1 & 2		Eastern WPA	Western WPA		
W-1	5	0 (21%)	1 (21%)	70	2 (3%)	15 (21%)	4	0	3	25	2
W-2	12	2 (18%)	4 (31%)	110	20 (18%)	34 (31%)	42	4	29-31	73	7
W-3	3	0 (0%)	0 (0%)	20	0 (0%)	0 (0%)	0	0	0	0	0
Totals	20	2	5	200	22	49	46 (low)	4 (low)	32-34 (low)	98 (moderate)	9 (low)

*One interaction = 3 miles of pipeline.

structures and artifacts, and would disturb the context of the entire site. The result would be loss of information on the cultural history of the region and the Nation. Often information contained in historical sites is unrecorded in written historical accounts. A site which contains such previously undocumented information may be the only surviving source of that information.

For purposes of this analysis, it is assumed that, of the coastal historic sites which may be impacted by onshore development some contain unique information and that others contain information available from other sources, the impact, should an interaction occur, would be moderate to very high (depending on the uniqueness of the data lost).

Under the M Scenario, the number of acres projected for disturbance from new onshore facilities in the Western Gulf is between 95 and 355. Due to the low amount of acreage projected for disturbance, the visibility of most onshore historic sites, and State and Federal cultural resources laws which require consideration of historic properties if any State or Federal funding or permits are required for construction, the risk of an interaction between an impact producing factor and a significant historic resource as a result of the projected onshore development is assessed as being low. Therefore, although the impact to onshore historic sites, should an interaction occur, would be moderate to very high, considering the low risk for an interaction occurring, the expected impact would be low to moderate.

One large (1,000 bbls or greater) and several smaller oil spill contacts are assumed with coastal archaeological sites (historic and prehistoric) as a result of the proposed action. Should one or more of these spill contacts be with a coastal historic site such as forts and lighthouses, the major impact would be visual due to oil contamination of the site and its environment. This impact would probably be temporary and reversible with no actual loss of information. Based on the criteria of significance outlined above, the impact to coastal historic sites from an oil spill, should one occur, would be low.

It is noted that the probability of a major spill contact is low (a 5% chance, Table IV-16). Considering the low level of impact which would result to coastal historic sites should an oil spill contact occur, and the low risk of a contact occurring, the expected impact would be very low.

The impact levels to historic sites, should an interaction occur with an impact producing factor from offshore development, onshore development, or an oil spill, would range from low to very high depending on the type of interaction and the uniqueness of the data lost as a result of the interaction. However, the risk of any of these impacts occurring is low.

Conclusion

The estimated level of impact to historic sites in the Western Gulf as a result of the proposed action is estimated to be moderate.

Cumulative Impacts

Other major factors which would affect significant historic cultural resources in the Western Gulf include trawling, sport diving/commercial treasure hunting, hurricanes, channel dredging, previous oil and gas development, and chronic, low level hydrocarbon contamination.

The cumulative impact section for the Central Gulf provides a general discussion of the impacts related to sport diving/commercial treasure hunting and channel dredging activities.

The most intensive areas of trawling in the Western Gulf are represented by the areas outlining the centers of abundance for brown shrimp (Visual No. 4-I). The probable impacts of trawling on significant historic resources are discussed in the cumulative impact section for the Central Gulf. Based on this discussion, it is probable that the impact on significant historic cultural resources in the Western Gulf due to trawling would be very low.

About one-third of the coast along the Western Gulf was hit with 16-20 tropical cyclones between the years 1901-1955 (DeWald, 1980). The other two-thirds had a slightly lower incidence of cyclones (11-15). Five major hurricanes also cut the Western Gulf between the years 1954-1977. The probable impact of tropical storms on significant historic resources is discussed in the cumulative impact section for the Central Gulf. Based on this discussion, it is probable that the impact on significant historic cultural resources in the Western Gulf from tropical storms would be very high.

At the end of 1983, there were about 456 platforms in place and 2,430 wells had been drilled in the Western Gulf, as compared to the additional 70 platforms and 1,910 wells (exploration, delineation, and production) estimated to result from Federal OCS activity under the Cumulative Scenario. The general impacts of previous oil and gas development on significant historic resources are discussed in the cumulative impact section for the Central Gulf. Based on this discussion, it is probable that the impact on significant historic cultural resources due to previous oil and gas development in the Western Gulf has been very high.

One large spill (1,000 bbls or greater) and a number of smaller spill contacts are assumed with coastal archaeological sites (historic and prehistoric) under the cumulative scenario. Such spill contacts with an historic site are expected to produce low or very high impacts depending on the type of interaction and the uniqueness of the specific resources affected. In addition, it has been estimated that the annual input of petroleum into the Gulf from all sources approaches 2.3 million bbls. This chronic hydrocarbon contamination could have an impact on cultural resources. However, since the impacts to historic sites from oil contamination are generally short-term and reversible, the expected cumulative impacts from oil contamination are estimated to be low.

Conclusion

The estimated level of cumulative impacts on the historic cultural resource base in the Western Gulf is expected to be very high.

(b) Prehistoric

Impacts Analysis

Offshore development as a result of the proposed action could result in an interaction between a drilling rig, platform, pipeline or anchors, and an inundated prehistoric site. This direct interaction with a site would destroy fragile artifacts or site features and would disturb the context of the entire site. The result would be the loss of archaeological data on prehistoric migrations, settlement patterns, subsistence strategies, and cultural contacts for North America, Central America, South America, and the Caribbean.

Due to the fact that any in situ prehistoric site located in the Western Gulf would provide unique information at this point in time and that many will provide unique information not available from any other sites (terrestrial or inundated), the impact, should an interaction occur, would be high to very high.

For each subplanning area in the WPA, Table IV-51 shows the percentage of blocks which fall within cultural resources Zones 1 and 2 (Visual No. 11), where there is a high probability for the occurrence of prehistoric sites dating prior to 3,000 B.P. Using this percentage, the number of exploration and delineation wells, platforms, and miles of pipeline which would occur within Zones 1 and 2 as a result of the proposed sale were calculated. These potential interactions with prehistoric resources were then totaled. Based on these figures, the risk of impacts occurring to prehistoric sites as a result of offshore development from Sale 105 would be moderate; however, the cultural resources lease stipulation will reduce this moderate potential for an interaction by allowing identification of significant prehistoric resources prior to development, thereby making avoidance or mitigation of potential impacts possible.

Assuming that the survey provided for by the lease stipulation is 90% effective in evaluating prehistoric site potential within a survey area (see analysis in Section II.A.1.c.(2) and Table II-2 of the Final Regional EIS), the lease stipulation will reduce the total number of possible interactions by 90%, thereby reducing the risk from moderate to low. Therefore, although the impact to prehistoric sites, should an interaction occur, would be high to very high, considering the low risk for an interaction occurring, the expected impact would be low to moderate.

Onshore development as a result of the proposed sale could result in an interaction between construction of new onshore facilities and a prehistoric site. This direct interaction with a prehistoric site would destroy fragile artifacts or site features and would disturb the context of the entire site. The result would be the loss of information on the prehistory of North America and the Gulf Coast Region.

If it is assumed that, of the coastal prehistoric sites which may be impacted by onshore development, some contain unique information and that others contain information available from other sites, the impact, should an interaction occur, would be moderate to very high (depending on the uniqueness of the data lost).

Under the M Scenario, the number of acres projected for disturbance from new onshore facilities in the Western Gulf is between 95 and 355. Due to the low amount of acreage projected for disturbance, and State and Federal cultural resources laws which require consideration of cultural resources if any State or Federal funding or permits are required for construction, the risk of an interaction between an impact producing factor and a significant prehistoric resource as a result of the projected onshore development is assessed as being low. Therefore, although the impact to offshore prehistoric sites, should an interaction occur, would be moderate to very high, considering the low risk for an interaction occurring, the expected impact would be low to moderate.

One large (1,000 bbls or greater) and several smaller oil spill contacts are assumed with coastal archaeological sites (historic and prehistoric) as a result of the proposed action. Should one or more of these spill contacts be with a coastal prehistoric site, the potential for dating the site using Carbon-14 would be destroyed. However, if diagnostic artifacts are present in the site, loss of C-14 dating potential may not constitute a loss of unique information; therefore, the impact would be moderate.

Previously unrecorded coastal sites may suffer direct physical impact from beach cleanup operations. Interaction of cleanup equipment with a site would destroy fragile artifacts or site features and would disturb the context of the entire site. The result would be the loss of information on the prehistory of North America and the Gulf Coast Region.

If it is assumed that, of the coastal prehistoric sites that may be impacted by beach cleanup operations, some contain unique information and that others contain information available from other coastal sites, the impact, should an interaction occur, would be moderate to very high (depending on the uniqueness of the data lost).

It is noted that the probability of a major spill contact is low (a 5% chance, Table IV-16). Therefore, although the impact which would result to a coastal prehistoric site, should an oil spill contact occur, would be moderate to very high, considering the low risk of a contact occurring, the expected impact would be low to moderate.

The impact levels to prehistoric sites, should an interaction occur with an impact producing factor from offshore development, onshore development or an oil sp' [illegible] range from moderate to very high depending on the type of interaction and the uniqueness of the data lost as a result of the interaction. However, the risk of any of these impacts occurring is low.

Conclusion

The expected level of impact to prehistoric sites in the Western Gulf as a result of the proposed action is estimated to be moderate.

Cumulative Impacts

Other major factors which would affect significant prehistoric cultural resources in the Western Gulf include trawling, hurricanes, channel dredging, previous oil and gas development, and chronic, low level hydrocarbon contamination.

The most intensive areas of trawling in the Western Gulf are represented by the areas outlining the centers of abundance for brown shrimp (Visual No. 4-I). The probable impacts of trawling on significant prehistoric resources are discussed in the cumulative impact section for the Central Gulf. Based on this discussion, it is probable that the impact on significant prehistoric cultural resources in the Western Gulf due to trawling would be very low.

About one-third of the coast along the Western Gulf was hit with 16-20 tropical cyclones between the years 1901-1955 (DeWald, 1980). The other two-thirds had a slightly lower incidence of cyclones (11-15). Five major hurricanes also cut the Western Gulf between the years 1954-1977. The probable impact of tropical storms on significant prehistoric resources is discussed in the cumulative impact section for the Central Gulf. Based on this discussion, it is probable that the impact on significant prehistoric cultural resources in the Western Gulf from tropical storms would be very high.

Because most channel dredging occurs at entrances to bays, harbors and ports, there is a high probability for impacts to prehistoric sites because of high site densities in these areas. Assuming that some of the data lost have been unique, the impact to prehistoric sites, as a result of past channel dredging activities, would be very high. In many areas, COE now requires remote sensing surveys prior to dredging to minimize such impacts.

At the end of 1983, there were about 456 platforms in place and about 2,430 wells had been drilled in the Western Gulf, as compared to the additional 70 platforms and 1,910 wells (exploration, delineation, and production) estimated to result from Federal OCS activity under the Cumulative Scenario. The general impacts of previous oil and gas development on significant prehistoric resources are discussed in the cumulative impact section for the Central Gulf. Based on this discussion, it is probable that the impact on significant cultural resources due to previous oil and gas development in the Western Gulf has been very high.

One large spill (1,000 bbls or greater) contact and a number of smaller spill contacts are assumed with coastal archaeological sites (historic and prehistoric) under the Cumulative Scenario. Such spill contacts with a prehistoric site are expected to produce moderate or very high impacts depending on the type of interaction and the uniqueness of the specific resources affected. In addition, it has been estimated that the annual input of petroleum into the Gulf from all sources approaches 2.3 million bbls. This chronic hydrocarbon contamination could have an impact on cultural resources. The impacts associated with chronic hydrocarbon contamination are discussed in the cumulative impact section for the Central Gulf. Based on this discussion, the impact of chronic hydrocarbon contamination in the Western Gulf in the loss of significant prehistoric site data may be very high.

Conclusion

The expected level of cumulative impacts on the prehistoric cultural resources base in the Western Gulf is estimated to be very high.

(12) Impacts on Tourist Activity/Industry

For a detailed discussion of the impacts on tourist activity and related industry, see Section IV.D.1.a.(12).

Impact Analysis

Increased levels of oil and gas production could increase the chance of an oil spill in the Gulf region. The assumed number of large spill (1,000 bbls or greater) contacts with recreational beaches is one. Although the potentially affected area includes beaches in both Louisiana and Texas, the only recreational beaches that have a discernible chance (1% or greater) of being contacted by such a spill are in Nueces, Brazoria, and Galveston Counties.

Reductions in income for beachfront motels and restaurants may result from an oil spill that contacts beaches or from other factors such as accumulations of trash and debris. In Nueces, Brazoria, and Galveston Counties, travel expenditures in 1983 were $266.7 million, $65.9 million, and $211.7 million, respectively. The amount of travel expenditures that are related to beach use is estimated as follows: Nueces - 50%; Brazoria - 50%; and Galveston - 75%. The amount of tourism at peak season is assumed to be 60% for Nueces, 50% for Brazoria, and 33% for Galveston. A spill contact with the recreational beaches in these counties could cause total tourism losses as follows: Nueces - $40.0 million; Brazoria - $8.2 million; and Galveston - $26.2 million. This effect on tourism expenditures would be intense during the year of the spill, amounting to losses of 15% for Nueces, 12.5% for Brazoria, or 12.4% for Galveston Counties. The maximum loss ($40.0 million) would be 3% of the total travel expenditures ($1,032.6 million) for the potentially affected area. The impact of an oil spill on tourism activity in these areas is considered moderate for each county, but very low for the area. The effect on employment, payroll, and tax receipts are assumed to be very low because of the limited duration (2-6 weeks) of the spill. The probability that such a spill contact would occur is low, as follows: Nueces - 1%; Brazoria - 3%; and Galveston - 7%. This indicates that such a spill contact is unlikely.

Conclusion

The expected impact of the proposed action on tourism activity in the Gulf region is estimated to be very low.

Cumulative Impacts

For the cumulative analysis, tourism activity in the Gulf region is expected to be affected more extensively. Estimates of expected average annual losses in the WCA and potentially affected adjacent areas were determined in the same manner previously discussed for the CPA. Estimates of cumulative losses are based primarily on the effects of oil spill contacts resulting from Federal OCS activity and crude oil imports by tankers in the Gulf. Impact producing factors not related to the Federal leasing program include sales in State waters and spills from tankers carrying imported oil. In addition, tourism may be adversely affected by increases in population pressure, beach use, and offshore commerce, which contribute to an increase in trash and debris on major shorefront beaches and parks. Expansion of residential, commercial, and industrial development along shorefront areas reduces beach access and exacerbates other adverse effects by restricting alternative choices for tourism.

Two large spill (1,000 bbls or greater) contacts are assumed with major recreational beaches as a result of Federal OCS activity (and crude oil imports by tanker) under the Cumulative Scenario. Tourism losses are assumed to be equivalent to 100% of an area's peak season receipts related to beach use because of the effects of the oil spill in combination with the impacts of population pressure, beach use, debris, and offshore commerce. The coastal areas which could experience one of these spill contacts are as follows: Cameron, Kenedy, Kleberg, Nueces, Brazoria, Galveston, and Jefferson Counties in Texas and Cameron Parish in Louisiana. Of these, Kenedy County reportedly has no tourism expenditures. Each spill contact with the recreational beaches in these areas, in association with other adverse impacts, could cause total tourism losses as follows: Cameron County - $184.8 million; Kleberg County - $1.0 million; Nueces County - $80.0 million; Brazoria County - $16.5 million; Galveston County - $52.4 million; Jefferson County - $10.2 million; and Cameron Parish - $0.01 million. The effect on tourism expenditures would be greatest during the years of the two spills, amounting to annual losses per spill as follows: Cameron County - 63.0%; Kleberg County - 5.0%; Nueces County 30.0%; Brazoria County - 25.0%; Galveston County - 24.8%; Jefferson County - 6.0%; and Cameron Parish - 0.25%. The net effects on tourism expenditures are very high in Cameron, Nueces, Brazoria, and Galveston Counties; low in Jefferson County; and very low in Kleberg County and Cameron Parish. The effect on employment, payroll, and tax receipts are assumed to be very low because of the limited duration (2-6 weeks) of the spill.

Because of the extensive oil and gas development in State waters, one or more spills in these areas may occur that will contact beaches important for tourism. The impacts of spills in State waters are assumed to be comparable to impacts from a spill that results from OCS leasing, i.e., very high in Cameron, Nueces, Brazoria, and Galveston Counties; low in Jefferson County; and very low in Kleberg County and Cameron Parish.

As domestic production declines, imports will increase and the number of spills and operational discharges from tankers may increase. Technological improvements in transportation facilities may offset this possibility. If spills occur, however, tourism losses could be comparable to those discussed above for a spill from OCS or from State waters.

In addition to oil spills, impacts to tourism include increases in trash, debris, and accumulations of congealed hydrocarbons (tarballs) washing up on major Gulf of Mexico shorefront beaches and parks, which poses a problem that adversely affects the aesthetics of beach and park use and contributes to administrative and maintenance problems. The causes of the debris seem to be oil and gas operations, the large increase in population near the Gulf of Mexico, and a steady increase in beach use, offshore commerce, and fishing. The primary cause of tarballs seems to be operational discharges from marine vessels.

Accidents associated with offshore oil and gas operations and weather (wind and waves) result in trash and debris entering the ocean and ultimately contributing to beach litter problems. Consequently, trash and debris are considered as an unavoidable adverse impact associated with the Federal leasing program. Part 5 of OCS Order No. 1, Part 1.2 of OCS Order No. 7, and associated regulations (30 CFR 250.43 and 250.54) were developed and applied to Federal lessees and their contractors in order to minimize and mitigate OCS contributions to ocean litter and its attendant environmental problems.

The maximum level of cumulative impacts is based on an assumption of two large spill contacts in association with other adverse impacts in the counties where tourism losses are greatest, i.e., Cameron County (184.8 million) and Nueces County ($80.0 million). The maximum impact is assumed, therefore, to be $264.8 million. However, a spill could occur in other counties where the impact would be less severe. Tourism losses from two spills in the WPA could range from a low of $0.01 million in Cameron Parish, Louisiana, to a high of $184.8 million in Cameron County, Texas. The maximum impact to the area ($264.8 million) represents 25% of average annual tourism receipts. Therefore, the net effect on tourism expenditures in the area would be very high. The probability that such a spill contact would occur (as a result of Federal OCS activity and the tankering of crude oil imports in the Gulf) is as follows: Cameron County - 2%; Kenedy County - 15%; Kleberg County - 10%; Nueces County - 13%; Brazoria County - 18%; Galveston County - 41%; Jefferson County - 16%; and Cameron Parish - 41%. Spill contacts are considered likely only in Galveston County and Cameron Parish.

Conclusion

Under the cumulative impact assessment, the expected impacts of the proposed action on tourism activity in the Gulf region are very high in Cameron, Nueces, Brazoria, and Galveston Counties; low in Jefferson County; and very low in Kleberg County and Cameron Parish.

(13) Impacts on Military Use/Warning Areas

For a generic discussion of impacts on military use/warning areas, see Section IV.D.1.a.(13).

Impact Analysis

Thirty-seven percent, or 12,000,000 acres, of the water and air space of the Western Gulf is used for the various military operations within two warning areas (Visual No. 11).

Military Use of Warning Areas

Warning Areas	Frequency of Use	Period of Use
W-228	Continuous	Continuous
W-602	Continuous	Continuous

Source: U.S. DOD, DMA, 1982b.

An intensive use of W-602 has not been indicated by the Air Force in the past and W-602 has had very little oil and gas development. W-228 has been intensively used by the Navy and has had considerable oil and gas activity. Past impacts have been very low in W-602 and moderate in W-228.

Sale 105 could result in significant adverse impacts on carrier flight qualification operations conducted in W-228, in the immediate vicinity of Corpus Christi. Aircraft carrier qualification operations in W-228 are critical to the training of U.S. Navy pilots, naval flight officers, and enlisted aircrewmen. These Navy personnel are being prepared to assume flying responsibilities in forward deployed naval aviation units throughout the world. A proposal to relocate these operations further seaward would not be feasible due to the fuel limitations of training aircraft and the associated requirement to keep them within safe flying distances of emergency divert fields ashore. It should be noted that existing oil and gas exploration and development platforms have significantly degraded training operations in the northern one-third of Warning Area 228, that portion nearest emergency divert fields. In addition, the extensive numbers of oil and gas leases acquired by the petroleum industry in the Western Gulf suggests that at some future point carrier qualification operations in Warning Area 228 will have to cease altogether for safety reasons unless restrictions are imposed on future lease sales.

It is estimated that within subplanning area W-1 of the Western Gulf (Figure IV-1), there will be 90 exploration wells drilled and 5 platforms; 186 exploration wells and 12 platforms in W-2.

W-602 is comprised of 935 blocks, or 29% of the acreage of W-2. W-228 has 1,340 blocks, or 54% of the acreage of W-1. Therefore, the projected activity for W-602 is expected to be 54 exploration wells and 3 platforms, and the projected activity for W-228 is 49 exploration wells and 3 platforms.

It is unlikely that the two platforms projected for W-602 will cause more than a low impact since the area has no development at present and the Air Force has a low intensity use of the area. The 54 exploration wells mean 54 different drilling locations within the warning area to be drilled by 18 drilling rigs between 1986 and 1993. The three platforms projected for W-228 may cause a high impact dependent upon their location relative to the locations of existing platforms. The greater the number of platforms and the less separation between the platforms, the less carrier maneuvering room within the warning area. The 49 exploration wells mean 49 different drilling locations for 17 drilling rigs over a period of 11 years between 1987 and 1997.

At most, the Navy will have to contend with two additional service vessels per day and four additional helicopters per day in their missions into W-228, and the Air Force will have to contend with one service vessel per day and two helicopters per day in their missions into W-602. These service vessels and helicopter flights can be monitored from primary service bases at Port Isabel, Corpus Christi, Port Aransas, Freeport, and Galveston, Texas; and Sabine Pass and Cameron, Louisiana.

Overall, the number of platforms and exploration rigs, given the moderate to high resource potential of the Western Gulf, can be considered as moderate; the number of service boats and helicopter trips attendant to the amount of exploration and production can be considered to have a low impact; and the location of the small number of platforms and exploration rigs in any one year is considered to be of moderate impact. Also, previous oil and gas development having had a low impact on military operations in the Western Gulf has been considered (Table IV-43).

In the Western Gulf approximately 2,275 lease blocks are affected by the military stipulation applied within designated warning areas. The stipulation and map showing the warning areas covered is in Section II.B.1.b.(13). This stipulation has been applied to blocks in military warning areas in past Western Gulf sales. When exploratory drilling and related service vessel traffic and helicopter flights have occurred in a warning area, the military has been informed of all drilling activity, vessel trips, and air flights. The military has had no problems to date with joint usage and has recommended utilizing the stipulation on all leasing operations within their warning areas. As a result of applying the military stipulation to all oil and gas leases in the past, no joint usage conflicts have occurred and the impact from oil and gas development has been very low.

The affect of the stipulation on the impacts of the proposed sale will be to reduce potential conflicts between military missions and service boat traffic and helicopter flights. The stipulation, where applied, requires the lessee/operator to notify the respective commander of each warning area of all activities scheduled within the area, including the placement of rigs and platforms, a notification prior to each service vessel and helicopter flight into the area, and an agreement by the lessee/operator to curtail all electromagnetic emissions while traveling through or into a warning area. The stipulation will have no affect on the location of exploration rigs and platforms or the number of vessels and helicopters, but it will mitigate the impact of an increasing amount of oil- and gas-related traffic.

Even though the impact of one potential conflict may be reduced, others will not be affected by the stipulation; therefore, the overall impact should remain as low and high.

Conclusion

The estimated level of impacts on military use of the warning areas is expected to be high for W-228 and low for W-602.

Cumulative Impacts

Cumulative impacts will relate to oil and gas development related to past sales, development as a result of Sale 105, and present and future trans-Gulf vessel traffic to and from Western Gulf ports and commercial and recreational fishing vessels.

The impacts from past oil and gas sales have been low. In W-228, there are over 231 active leases, at least 100 wells have been drilled, and 12 platforms have been installed. All development is in the western half of the warning area. In W-602 where there are 84 leased blocks, over 100 wells have been drilled, and 21 platforms in place. All development is in the northern one-third of the warning area. The impacts from past leasing have been low in W-602 and moderate in W-228. The cumulative impacts of past and present sales are expected to remain low for W-602 and increase to high for W-228.

Projections for Sales 67, 69, and 74, for the Western Gulf of Mexico Lease Offering (July 1984), Sale 102, and Sale 105 will result in 67 rigs at 200 drill sites in W-228, and 60 rigs at 180 drill sites in W-602. The projections also include 27 new platforms in W-228 and 20 new platforms in W-602. These numbers are consistent with the current rate of drilling and development in both areas and should not cause any higher impact than the current levels. The resultant increase in service boat trips and helicopter flights will be the same as the current rate of increase at 200%-250%. (Sales 67, 69, and 74 were projected to be 250% greater than the preceding series of sales for this area.)

The cumulative numbers of service vessel trips and helicopter flights have not increased sufficiently to present an interference with military operations. In W-602 the number of exploration rigs and platforms will not restrict, curtail, or shift Air Force missions within the warning area. However, the locations of exploration rigs, and particularly platforms in W-228, may restrict the ability of aircraft carriers to maneuver for pilot training.

In addition to the impacts from oil and gas activities, ocean-going vessel traffic, and commercial and recreational fishermen and boaters impact military operations in the Western Gulf of Mexico. In 1982, 164,288 vessels entered and exited ports in the Western Gulf. Of this total, 17,523 vessels of draft greater than 18' traversed the fairways of the deep Gulf waters. All vessel traffic close to shore in the vicinity of W-228 poses an operational problem to carrier manuevers and pilot training within the area. Warning Area 602 is in deepwater and would be impacted by trans-Gulf vessel traffic only. At present, the military has no operational control, and, in many cases, no warning of when and where this traffic will be passing into or crossing through the warning areas. Commercial fishing vessels are covered in the above statistics for all vessel traffic; however, recreational fishermen and boaters are not. Warning Area 602 will not be affected by the recreationalists due to its distance from shore. Warning Area 228, in extending in to shore, has large numbers of recreational fishermen, sailboaters, and other recreational boaters passing into and through the warning area. The impact from vessels, other than oil- and gas-related vessels, is far greater than the impacts projected from oil- and gas-related vessel traffic.

All air traffic is controlled by the FAA, and civilian air traffic into the warning areas is either curtailed, prohibited, or in most cases, rerouted to avoid conflicts with military operations during their peak or intensive use periods.

The number and area covered by the military missions is an important factor that impacts the joint use of the areas. If the military continues to accelerate their use of the warning areas over the next several years as they have for the past four years, the conflicts that could result from a joint use may cause the military to completely abandon carrier operations in W-228. This, in turn, may intensify the Navy's carrier operations from the Pensacola and Key West areas further presenting joint use conflicts in those areas.

Conclusion

The estimated level cumulative impacts on the Western Gulf warning areas are expected to be low in W-602 and high in W-228.

(14) Impacts on Water Supply

The nature of impacts on local water supplies are essentially the same as those described for the Central Gulf (Section IV.D.1.a.(14)).

Impact Analysis

As in the Central Gulf, increased demands on coastal water resources in the Western Gulf may be expected to occur as a result of elevated OCS activities in this area. Changes in population and increased industrial activities may result in association with expanded OCS support activities resulting from the proposed sale. Based on MMS estimates for the M Scenario of the Western Gulf, an estimated peak water consumption of 164.8 million gallons/year can be expected by 1998 (Table IV-44), which equates to approximately 451,500 gallons/day. It is currently estimated that up to one new service base (0-1 in W-1) may be constructed as a result of the proposed alternative under the M Scenario. Projected peak (1987) new resident population growth associated with the proposed action is estimated to be minimal (954 persons) in the WPA and 127 persons in the CPA. The majority of this growth is expected to occur in subplanning areas W-2 (715 persons) in the WPA and C-1 (127 persons) in the CPA. No significant increases in local water usage will occur as a result of new population growth; therefore, very low impacts are estimated as a result of population increases associated with the proposed action. Low to moderate impacts of a localized nature could be experienced, particularly in areas currently experiencing water supply shortages, such as the Sabine Pass and Houston-Galveston areas, as a result of increased water usage by onshore support operations.

Conclusion

The proposed action is expected to have a low impact on regional water supplies in potentially affected locations in the Texas coastal area.

Cumulative Impacts

In addition to those impacts discussed above, resulting from the proposed action, the addition of up to 7 new service bases, up to 2 new gas processing plants, up to 1 platform fabrication yard, up to 50 platforms, up to 900 exploration/delineation wells, and up to 520 production wells will impact area water supplies as a result of prior OCS-related activities. These impacts to water supply will result in increased burdens on existing water resources. Mitigation of water supply-related impacts will require prudent site selection of these projected onshore support facilities in areas known to possess ample surface and groundwater supplies at present, and with water resource conservation and development plans for the future. OCS-generated new resident population in the Texas coastal area would be widely distributed over 14 counties and could account for increased demands for residential water usage ranging from less than 0.05% to as high as 7%. Overall, these OCS-generated cumulative demands are expected to have a low to moderate impact on the water supply of the potentially affected area.

A 1982 report by the Texas Department of Water Resources on "An Overview of Texas Water Resources Problems and Water Resource Issues" discusses current and future water resource problems in the state of Texas. This report shows conclusively the high cumulative impacts from population and non-OCS-related activities in the Western Gulf.

Aquifers currently supply approximately 75% of the water used in Texas, and the water supplies of several of these major aquifers are slowly being depleted with the rate of depletion being varied from area to area and depending upon the geologic hydrologic (water bearing) characteristics of each aquifer, the quantity of natural recharge and the rate of pumpage within each area. As groundwater levels decline and growth in water needs increases, the competition for remaining surface-water and groundwater resources will continue to increase, resulting in fewer and fewer options for adding new water supplies. In addition, under present practices of groundwater development and use, it is difficult to predict accurately the time of need and staging of reservoirs that will be needed to supply surface water to offset declining groundwater supplies. For example, neither local nor state water planners have adequate information about future use of groundwater that can be depended upon in specific areas of the state in the future. Consequently, there has been a tendency to use past trends to predict future use of groundwater in an area. However, current knowledge indicates that the solution to land subsidence, salt water encroachment, spring flow protection, and other considerations dictates that pumpage rates different from past trends of groundwater use are desirable and needed in some areas.

Water use statistics reported by industry and energy sectors show that water conservation measures are being developed and adopted in practically all of the manufacturing and energy sectors. It appears that two major factors underlie this phenomenon-rising energy costs and costs of treating and reclaiming industrial waste water. The trend is expected to continue for several years until the goals of Federal "clean water" legislation are reached and as long as energy costs continue to rise; however, there is a limit as to how much reduction in quantity of water used per unit of product can be achieved unless technology in production processes is improved. Growth in water use by industry is expected to continue as the site of the industrial base increases, i.e., as additional plants and new water using industries are located in Texas.

Conclusion

The overall cumulative impact which includes the effect of non-OCS population and industrial growth is expected to be very high.

(15) Impacts on Local Employment, Income, and Population

Section III.C.5. clearly addresses the economic importance of Federal OCS-related oil/gas activity in the Gulf of Mexico to the coastal region of Texas. Section IV.D.1.a.(15) includes an introductory discussion which generally addresses the economic conditions in both the Central and Western Gulf immediately prior and subsequent to the first and second years of Gulf of Mexico areawide lease sales. Also included therein is a summary of the methodology and assumptions used in the projection of economic impacts in both the Central and Western Gulf coastal regions for this EIS.

Impact Analysis

MMS analysis indicates that Federal OCS activity in the WPA affects the coastal regions of Texas and Louisiana. Historical data for the Louisiana coastal region on direct oil and gas employment (SIC 13) as well as projected employment with and without proposed Sales 104 and 105 have already been provided in Section IV.D.1.a.(15) of this EIS (Figure IV-5). The following graph, Figure IV-6, illustrates the SIC 13 employment history and outlook for the Western Gulf coastal region during the 1980-2006 period.

Projections both with and without proposed Sale 105 are included therein. Employment projections with the proposed WPA lease sale are based on the well drilling, platform, and pipeline requirements estimated under the M Scenario. Employment projections without proposed Sale 105 assume no WPA sales after 1985. These without sale projections are used for comparative analysis.

As shown in Figure IV-6, Western Gulf SIC 13 employment increased over the 1980-82 period. However, in 1983 a decrease is estimated to have occurred, based on MMS data on mobile rig activity for the Gulf OCS. Furthermore, this decline is estimated to have been halted in 1984 by employment growth resultant from increased drilling activity associated with the 1983 and 1984 WPA areawide lease sales. It is the MMS conclusion that these sales have partially restored coastal oil- and gas-dependent economies, which were depressed in late 1982 and much of 1983. Furthermore, employment opportunities expected from 1983, 1984, and 1985 Western Gulf areawide lease sales (Sales 74, 84, and 102) are expected to continue to improve Western Gulf economic conditions until 1987. Thereafter, a gradual decline in employment is expected. Both the growth and decline in direct oil and gas employment associated with Gulf lease sales prior to 1986 are illustrated in Figure IV-6.

The direct effect of proposed Sale 105 on Western Gulf coastal oil and gas employment is primarily illustrated by the shaded area in Figure IV-6. About 11% of the employment from proposed Sale 105 was illustrated in Figure IV-5 (Section IV.D.1.a.(15)) of this EIS. Table IV-60 enumerates this direct effect, as well as related secondary and induced effects, by affected coastal subareas. Proposed Sale 105 is expected to provide employment to both Central and Western Gulf residents throughout the 1987-2006 period. Sale 105-generated employment is expected to peak in 1991 at 5,975 jobs.

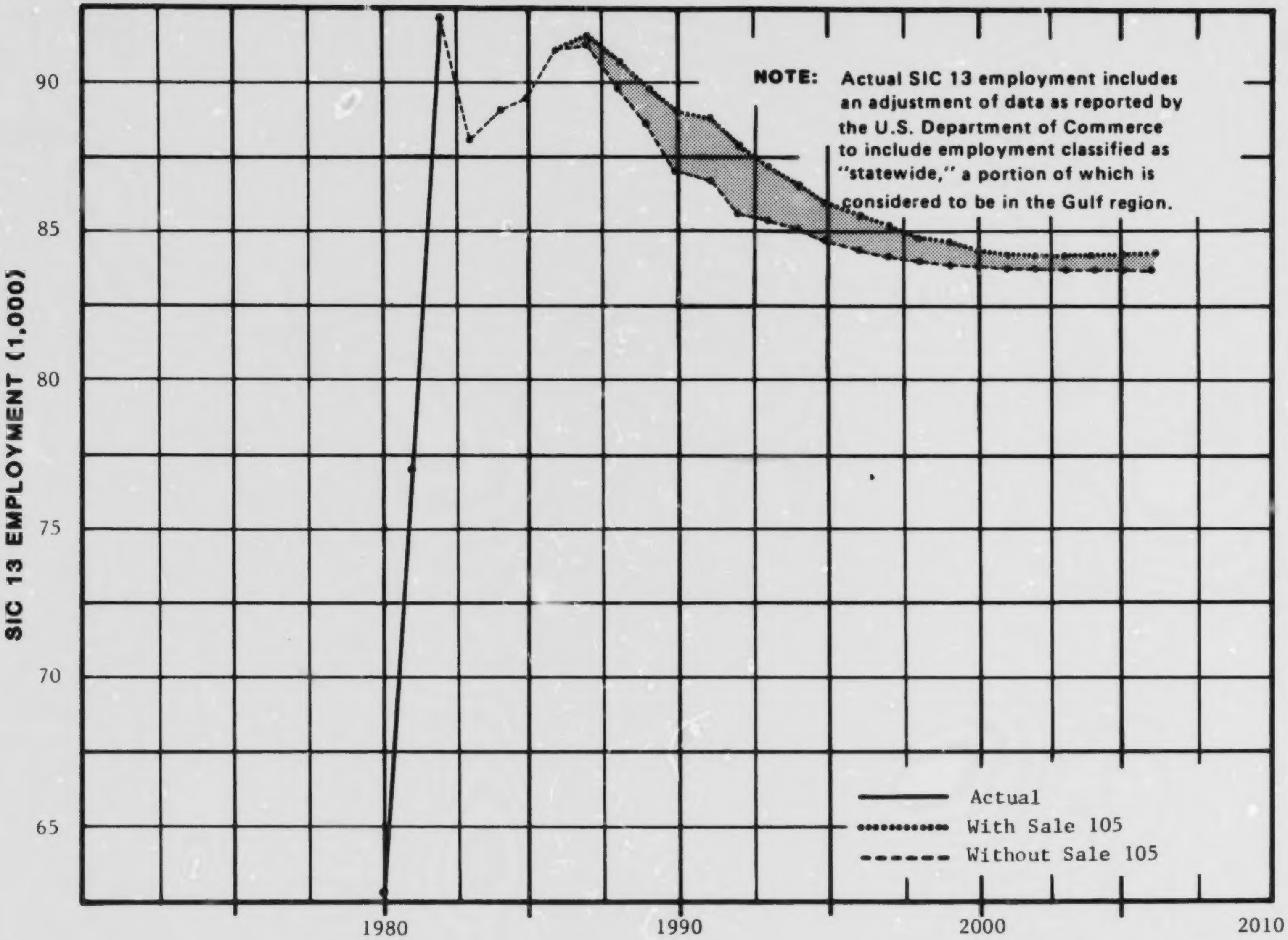
While the total and peak year level of job opportunities created by proposed Sale 105 are noteworthy, a more important parameter is the amount of proposed Sale 105-generated jobs which attract new residents into the Gulf coastal region, which is shown in Table IV-61. MMS analysis indicates that new residents to the Gulf coastal region due to proposed Sale 105 will be small in number (1,081) and will occur only in 1987. Generally, the peak in affected Central and Western Gulf parishes and counties represents the additional employment necessary to support exploratory drilling in the first year of activity for proposed Sale 105. New residents are needed to meet this requirement because in 1987 all existing manpower is expected to be used to support activities associated with the 1983, 1984, and 1985 areawide lease sales. Subsequent to 1987, proposed Sale 105 will allow a continuation of some existing oil/gas-related jobs in the CPA and WPA.

Personal income associated with this new resident employment will average $24,500 (1982 dollars) per employee in comparison to an average payroll per employee in 1982 for all workers in the affected Central and Western Gulf coastal regions of $17,700.

Also, under the M Scenario, well drilling, platform fabrication, and other equipment expenditures resulting from the proposed action are expected to total $4.3 billion throughout the life of sale-related exploration and development activity. A major portion of these expenditures are expected to remain in the coastal region.

Conclusion

Based on the level of peak year (1987) new resident activity, the impact of the proposed action all affected Gulf coastal subareas is expected to be very low.



NOTE: Actual SIC 13 employment includes an adjustment of data as reported by the U.S. Department of Commerce to include employment classified as "statewide," a portion of which is considered to be in the Gulf region.

Figure IV-6. Direct Oil and Gas Employment in the Western Region (Onshore and Offshore) Most Likely Find Scenario.

Table IV-60

Sale 105 - Related Employment Projections by Affected Coastal Subareas
(Most Likely Find Scenario)

	Coastal Subarea W-1				Coastal Subarea W-2			
Year	Direct	Secondary	Induced	Total	Direct	Secondary	Induced	Total
1987	74	3	25	102	154	81	78	313
1988	273	39	103	415	566	644	399	1609
1989	425	61	160	646	880	1002	621	2503
1990	659	94	248	1001	1365	1554	963	3882
1991	715	102	270	1087	1480	1686	1045	4211
1992	696	100	263	1059	1441	1641	1017	4099
1993	575	82	217	874	1192	1358	842	3392
1994	479	69	181	729	993	1131	701	2825
1995	424	61	160	645	878	1000	620	2498
1996	364	52	137	553	754	859	532	2145
1997	335	48	130	513	693	789	489	1971
1998	305	33	112	450	632	389	337	1358
1999	273	29	100	402	566	347	301	1214
2000	157	17	57	231	325	200	173	698
2001	157	17	57	231	325	200	173	698
2002	157	17	57	231	325	200	173	698
2003	157	17	57	231	325	200	173	698
2004	157	17	57	231	325	200	173	698
2005	157	17	57	231	325	200	173	698
2006	157	17	57	231	325	200	173	698

	Coastal Subarea C-1				Total			
Year	Direct	Secondary	Induced	Total	Direct	Secondary	Induced	Total
1987	37	4	14	55	265	88	117	470
1988	137	58	64	259	976	741	566	2283
1989	212	90	100	402	1517	1153	881	3551
1990	329	140	155	624	2353	1788	1366	5507
1991	357	152	168	677	2552	1940	1483	5975
1992	348	148	164	660	2485	1889	1444	5818
1993	288	122	135	545	2055	1562	1194	4811
1994	240	102	113	455	1712	1302	995	4009
1995	212	90	100	402	1514	1151	880	3545
1996	182	77	85	344	1300	988	754	3042
1997	167	71	79	317	1195	908	698	2801
1998	153	47	66	266	1090	469	515	2074
1999	137	42	59	238	976	418	460	1854
2000	78	24	34	136	560	241	264	1065
2001	78	24	34	136	560	241	264	1065
2002	78	24	34	136	560	241	264	1065
2003	78	24	34	136	560	241	264	1065
2004	78	24	34	136	560	241	264	1065
2005	78	24	34	136	560	241	264	1065
2006	78	24	34	136	560	241	264	1065

Table IV-61

Sale 105 - Related New Resident Projections

Coastal Subarea	Year of Peak Impact	New Resident Projections		
		Employment	Payroll	Population
		Low and Most Likely Find Scenarios		
W-1	1987	104	$ 2,548,000	239
W-2	1987	311	$ 7,619,500	715
C-1	1987	55	$ 1,347,500	127
Total	1987	470	$11,515,000	1,081
		High Find Scenario		
W-1	1987	439	$10,755,500	1,010
W-2	1987	1,855	$45,447,500	4,266
C-1	1987	258	$ 6,321,000	593
Total	1987	2,552	$62,524,000	5,869
		Total Find Scenario		
W-1	1991	822	$20,139,000	1,891
W-2	1991	2,936	$71,932,000	6,753
C-1	1987	65	$ 1,592,500	150
Total	1987, 1991	3,823	$93,663,500	8,794

Cumulative Impacts

The cumulative impact analysis for the WPA is based on the expectations of the proposed actions in the Gulf of Mexico, as well as the projected effects of past leasing and other existing employment producing activities (in all industries). Total population, employment, and income in the Central and Western Gulf coastal region is addressed in Section III.C. These aggregate indicators of economic activity have been projected by MMS on the basis of growth trends for SMSA's and other substate regions prepared by USDC. These growth trends were derived for use in the published report, 1980 BEA Regional Projections, which was developed under the supervision of USDC's Bureau of Economic Analysis. Since this analysis was based on historical data through 1978 only, MMS continually analyzes these projections in light of more recent information. The projections used for this EIS reflect a consideration of historic data through 1982. Total employment, income, and population in the coastal region based on this analysis is expected to grow throughout the next 10 years at an average rate of 1% annually in the Central Gulf and 2% annually in the Western Gulf, even without additional OCS oil and gas lease sales. The proposed actions will have a negligible effect on these total average annual growth rates since these sales are expected to result in much less than 1% growths in economic activity in each affected coastal subarea, as previously discussed in this report.

Conclusion

The cumulative effect will be an average annual growth rate of about 1% in the Central Gulf and 2% in the Western Gulf, which are considered low impact levels.

(16) Impacts on Community Infrastructure

Community infrastructure, as used in this analysis, includes commonly provided public, semipublic, and private services and facilities, such as education, police and fire protection, sewage treatment, solid waste disposal, water supply, recreation, transportation, health care, other utilities, and housing. During the scoping process, concerns were raised about the potential adverse effects of OCS-related activity on the quality of community infrastructure: that new or expanded activity in certain locations could result in significant increases in the demand and usage of community infrastructure; and that serious adverse effects could arise if the amount or rate of increase in the usage significantly exceeded the capability of a local area to provide a satisfactory level of service.

The development scenario for the proposed action (M Scenario) described in Section IV.A.1. postulates that offshore exploration, development and production activities, and onshore support services and processing activities will increase employment opportunities and generate new resident population in the coastal region.

Population growth is considered the major impact producing factor for community infrastructure because it increases the demand for, and use of, community services and facilities listed above. Such increases could cause reductions in the quality of service and other adverse effects (e.g., fewer, less frequent services; crowding or congestion of facilities; shortages in supply; reductions in service standards; and fiscal balance problems).

Additional discussion on the general effects of population growth on community services and facilities, existing mitigation measures, and definitions of the impact levels used in this analysis are included in Section IV.D.1.a.(16).

Impact Analysis

A total OCS-generated population growth of 900 people is estimated as a result of Sale 105. This growth is estimated to occur from July 1986 through 1989 and to be distributed by coastal subareas and potentially affected counties as shown in Table IV-62.

Table IV-62

Community Infrastructure Impact Indicators: Sale 105 (Western Planning Area)

Coastal Subarea/ County/State	Estimated Population 1986 (1000)	Proposed Action OCS-Generated Population: Total[1] Increase (1000)	Proposed Action OCS-Generated Population: Average[2] Annual Increase (%)	Baseline Population Change: Average[3] Annual Increase (%)	Cumulative Population Change: Average Annual Increase (%)	T Scenario OCS-Generated Population[5]: Total[1] Increase (1000)	T Scenario OCS-Generated Population[5]: Average[2] Annual Increase (%)	H Scenario OCS-Generated Population: Total[1] Increase (1000)	H Scenario OCS-Generated Population: Average[2] Annual Increase (%)
Coastal Subarea W-1	738.3	0.2	**	2.0	2.1	1.9	**	1.0	**
Aransas, TX	14.8	*	**	0.8	0.8	*	**	*	**
Calhoun, TX	24.5	*	**	5.0	5.0	0.1	**	*	**
Cameron, TX	233.3	*	**	2.2	2.2	0.2	**	0.1	**
Jackson, TX	16.8	*	**	4.9	4.9	*	**	*	**
Kenedy, TX	0.5	*	**	**	**	*	**	*	**
Kleberg, TX	34.7	*	**	0.8	0.8	0.1	**	0.1	**
Nueces, TX	283.2	0.1	**	1.1	1.1	1.0	**	0.5	**
Refugio, TX	9.6	*	**	0.8	0.8	*	**	*	**
San Patricio, TX	61.3	*	**	1.1	1.1	0.2	**	0.1	**
Victoria, TX	86.1	*	**	4.9	4.9	0.2	**	0.1	**
Willacy, TX	18.5	*	**	1.2	1.2	*	**	*	**
Coastal Subarea W-2	3,434.1	0.7	**	2.3	2.3	6.8	**	4.3	**
Brazoria, TX	189.2	*	**	2.3	2.3	0.4	**	0.2	**
Chambers, TX	23.2	*	**	4.9	4.9	*	**	*	**
Galveston, TX	209.7	*	**	1.4	1.4	0.4	**	0.3	**
Harris, TX	2,696.7	0.5	**	2.4	2.4	5.3	**	3.3	**
Jefferson, TX	268.0	*	**	1.4	1.4	0.5	**	0.3	**
Matagorda, TX	47.3	*	**	4.9	4.9	0.1	**	0.1	**
Coastal Subarea C-1	0.1	*	**	1.5	1.5	0.1	**	.6	**
Total	4,217.5	0.9	**	2.2	2.2	8.8	**	5.9	**

*Denotes an increase of less than five persons.

**Denotes an increase of less than 0.05%.

[1] The maximum or peak year levels of OCS-generated new resident population. The county estimates represent maximum shares of the coastal subarea totals; therefore, they are not additive.
[2] The average annual increase in OCS-generated population expressed as a percentage of the baseline population in the beginning year.
[3] The projected average annual percentage increase in the baseline population.
[4] Proposed action plus baseline population change.
[5] Effects of T Scenario are analyzed in Section IV.D.2.e.(16).

Note: Impact levels are based on average annual growth rates as follows: less than 0.5% (very low); 0.5%-1.4% (low); 1.5%-2.9% (moderate), 3%-9.9% (high); and greater than 10% (very high).

Source: USDI, Minerals Management Service, Gulf of Mexico OCS Region estimates.

Coastal subarea W-1 is estimated to experience an OCS-generated population growth of 200 people, representing an annual growth rate of less than 0.05%. Nueces County is expected to have the greatest total increase of 100 people; however, all of the 12 potentially affected counties have an estimated average annual population growth rate of less than 0.05%. These very low growth rates indicate a corresponding very low level of expected impacts on community infrastructure.

Coastal subarea W-2 is estimated to experience an OCS-generated population growth of 700 people, representing an annual growth rate of less than 0.05%. All the potentially affected counties are also estimated to have annual growth rates less than 0.05%. On the basis of these very low OCS-generated population growth rates, it is expected that adverse impacts on community infrastructure will be negligible to minor.

Coastal subarea C-1 is estimated to have an OCS-generated population growth of 100 people as a result of Sale 105. This represents an annual growth rate of less than 0.05%. This very low growth rate indicates a corresponding very low level of expected impacts on community infrastructure.

In summary, the total OCS-generated population growth resulting from Sale 105 is estimated at 900 people. These new residents will result in increased demands for, and use of, commonly provided public, semipublic, and private services and facilities (Table IV-47 lists the effects of population growth on community services and facilities) which could have adverse effects. The analysis estimates that the new residents would be distributed among the 17 potentially affected counties of the WPA and in the Central coastal area (five parishes) as indicated in Table IV-62. None of these counties is estimated to experience an average annual increase of more than 200 people or an average annual population growth rate of more than 0.045%. This indicates that negligible to minor adverse effects on community services and facilities are likely to occur as a result of the proposed action.

Conclusion

The analysis finds that the expected level of impact on community infrastructure would be very low.

Cumulative Impacts

The indicators of potential cumulative impacts are the combined peak rates of population growth generated by the proposed action plus the baseline population growth (which includes the effects of prior OCS sales). As shown in Table IV-62, these combined rates (average annual percentage increases) are significantly greater than the growth rates associated with the proposed action alone. This reflects the baseline population growth which accounts for over 99% of the combined rates. The baseline population growth is expected to continue over the entire period of exploration, development, and production associated with the proposed sale, but at somewhat lower growth rates after 1990. Baseline population growth rates for specific parishes in C-1 are indicated in Table IV-48.

Conclusion

The analysis indicates that the expected peak levels of cumulative impacts on community infrastructure will be very low for one county, low for eight counties, moderate for three counties, and high for five counties in the Western coastal area and very low to moderate for the five parishes of the Central coastal area (Table IV-62).

(17) Impacts on State and Local Land Use Management

This analysis is concerned with the degree to which the proposed action, if implemented, would conflict with approved CZM and local land use management programs in the affected states and whether necessary offshore and onshore support activities/facilities resulting from the sale can be designed, constructed, and operated in a manner compatible with the relevant objectives and implementing provisions of these programs. It is noted that the following discussion and analysis should not be construed as a determination of the proposed action's consistency with any state's CZM program, but rather as an analysis in compliance with NEPA sections 1502.16(c) and 1506.2(4)(d).

The States of Alabama, Mississippi, and Louisiana have federally approved coastal zone management programs. The State of Texas manages coastal development independently of the federal CZM program. Regional planning organizations, made up of a number of counties/parishes and cities, exist in the coastal areas of each state. These planning organizations generally conform to state coastal policies and expand these policies into plans and implementation recommendations. A state by state general description of CZM policies and a listing of the affected regional planning organizations is included in Section III.C.4.

The estimated amounts and general locations of offshore and onshore activities and facilities likely to result from the proposed action are identified in the M Scenario described in Section IV.A.1. This scenario represents a hypothetical framework of assumptions and estimates of the amounts and general locations of exploration, development, and production activities/facilities considered suitable for presale analysis of potential impacts. The scenario is not intended as a development plan; it does not represent recommendations or commitments to particular locations or types of facilities.

It is noted that if proposed Sale 105 is held all subsequent proposals by operators to undertake exploration, development, and production activities must go through necessary Federal, State, and local review and permitting processes to ensure that suitable procedures and sites are used and potential adverse impacts are mitigated. Historically, in the Gulf region offshore operators have been able to accommodate the concerns of the states with approved CZM programs in regard to the consistency requirements for exploration, development, and production proposals and other Federally permitted activities. States and operators have agreed to terms and conditions not initially deemed necessary or appropriate in order to address a site-specific problem. This demonstrates that the administrative framework has the flexibility to allow the reconciliation of site-specific questions which emerge after the lease sales.

At the presale stage when there are no site-specific proposals of operators to review, analysis of potential impacts (conflicts or incompatibilities) must be based on the hypothetical development scenarios and reasonable estimates of the degree to which OCS offshore and onshore activities and facilities can be designed, located, constructed, and operated in a manner consistent with State and local policies, plans, and regulations.

The five levels of impact used in the analyses and conclusions that follow are described in Section IV.D.1.a.(17).

Table IV-49 indicates the amount of land generally used for new onshore support and processing facilities, including service bases, pipe coating yards, pipelines, marine terminals, platform fabrication yards, and gas processing plants. A description of the major characteristics of service bases, pipe coating yards, platform fabrication yards, and gas processing plants is included in Section IV.D.1.a.(17). It is noted that these facilities are impact producing factors or agents with respect to a number of other environmental and socioeconomic resources of concern. The impacts on these concerns (e.g., sensitive coastal habitats, endangered and threatened species, commercial fishing, designated environmental preservation areas, tourism activity/industry, and water supply) are discussed elsewhere in Section IV.D.

Impact Analysis

The estimated number of major new onshore facilities used in support of offshore development under the M Scenario for proposed lease Sale 105 is discussed in Section IV.A.1.e.

Onshore support and processing services for offshore drilling and production under the M Scenario for Sale 105 are estimated to be provided almost entirely from existing facilities in Louisiana, Mississippi, Alabama, and Texas. The Central and Western coastal areas have a highly developed system of onshore support and processing infrastructure serving oil and gas development in the OCS, as well as in State offshore waters, wetlands, and upland areas. Much of this infrastructure currently has unused or readily expandable capacity.

The only new facilities estimated under the M Scenario are possibly up to three (0-3) pipeline landfalls with up to 60 miles of onshore routing in coastal subareas. Potential locations for the pipeline landfall include Matagorda, Brazoria, Galveston, Chambers, and Jefferson Counties in Texas.

The State of Texas manages coastal development independently of the Federal CZM program. Texas has a network of 14 State agencies involved in the regulation of coastal development and resources including air quality, water resources, parks and wildlife, marine life, oil and gas activities, and public land/waters under tidal effect including bays, rivers, and Gulf of Mexico waters within the State's jurisdiction.

Analysis of the activities/facilities estimated under the M Scenario, Texas coastal management program, and local land use policies indicates that potential incompatibilities or conflicts can be avoided or effectively mitigated. Postsale proposals to use specific sites must go through necessary Federal, State, and local review and permitting procedures. Experience in the Gulf indicates that this regulatory framework can be sufficiently flexible to allow reconciliation of most site-specific problems which could emerge after a sale. Coastal management and local land use planning programs do not seek to prohibit or preclude these activities in the coastal region (although certain sensitive areas may be "off-limits" to some or all development); rather, they attempt to guide and control development to ensure suitable procedures and sites are used and that potential conflicts and adverse impacts are mitigated.

The general provisions of the LCRP which could affect OCS-related activities/facilities are listed in Section IV.D.1.a.(17).

Conclusion

The analysis indicates that it is possible for the activities/facilities resulting from the proposed action to be designed, located, constructed, and operated in a manner such that the expected level of impact on state and local land use management policies will be very low.

Cumulative Impacts

Cumulative impacts on state and local land use management include the impacts of the proposed action as discussed above, plus impacts related to prior OCS sales and to major non-OCS impact producing factors affecting the coastal area.

Estimated facilities construction resulting from OCS sales held prior to the proposed action are included in Table IV-12. The estimated numbers and types of these facilities are as follows: 1-8 service bases; 0-2 pipe coating yards; 1-5 pipeline landfalls; 0-1 platform fabrication yard; and 0-2 gas processing plants. The likely potential locations for these new facilities are the same as described above and in the analysis of the total find scenario impacts in Section IV.D.2.d.(17).

Non-OCS factors include all those activities which can cause potentially major impacts to, or conflicts with, the policies, objectives, and regulatory requirements/guidelines of local land use plans and coastal zone management programs. Broadly stated, these activities include residential, commerical, industrial, agricultural, institutional, recreational, energy, and transportation facilities, and other development. It is noted that such development has had major adverse impacts on unique, valuable, and critical attributes of the coastal environment. In addition, such growth and development is expected to continue in many areas of the Texas and Louisiana coast. This future growth and development, as in the past, is expected to stress and threaten to cause potentially major adverse impacts to environmental and socioeconomic resources in the coastal region.

Texas coastal regulations and the applicable provisions of LCRP which could affect future activity and development in the coastal zone, including new facilities described above, are discussed under the preceding analysis of the proposed action.

Analysis of the activities/facilities considered in this cumulative impact analysis and the coastal programs and local land use plans indicates that potential impacts, incompatibilities, or conflicts can be avoided or effectively mitigated. As previously noted, all postsale proposals by operators to use specific sites for a particular activity/facility must go through necessary Federal, State, and local review and permitting procedures. Experience has indicated that this administrative framework can be sufficiently flexible to allow reconciliation of most site-specific problems. Coastal and local land use management programs do not seek to prohibit development in the coastal region (although some sensitive areas may be "off-limits" to certain development), rather, they attempt to guide and control development to ensure that suitable procedures and sites are used and that potential conflicts and adverse impacts are mitigated. This analysis assumes that these programs, plans, and regulations will be effective.

Conclusion

It is considered possible for the estimated OCS-related and most non-OCS-related activities/facilities to be designed, located, constructed, and operated so that the expected level of impact on state and local land use management policies would be low.

(18) Impacts on Ports and Marine Transportation

A general description of the factors involved in the following analysis and the definitions of the resulting impact levels are found in the introductory portion of Section IV.D.1.a.(18).

Impact Analysis

The WPA has been the site of oil and gas (primarily gas) activities for some time. Its offshore infrastructure and onshore support bases are not as extensive as those in the CPA but are fairly well-developed, as can be seen on Visual No. 7. The area accounted for over one-third of the vessel traffic to and from all Gulf coast ports in 1982, with almost one-third of this traffic passing through the channel into Galveston Bay.

The impacts of the proposal on vessel traffic are evaluated for subareas W-1 and W-2, and subarea C-1 in the CPA. The latter may be affected by potential activity in subarea W-3 which is located seaward of subarea C-1. Vessel traffic in subarea W-1 is expected to increase by 10% or 2,100 trips in the peak year of activity resulting from the proposed action (1991) over the 1982 level of 20,225. Ports likely to be affected are Corpus Christi, Port Aransas, Port Isabel, Port Mansfield, and Port O'Connor. Traffic in subarea W-2 is expected to increase by 3% or 4,350 trips in the peak year over the 1982 level of 144,063. Ports likely to be affected are Freeport, Galveston, and Sabine Pass. Traffic in subarea C-1 is expected to increase by 3% or 1,050 trips in the peak year over the 1982 level of 41,134. Ports likely to be affected are Cameron, Intracoastal City, and New Iberia.

Twenty structures are expected to be emplaced as a result of the proposal: 5 in W-1, 12 in W-2, and 3 in W-3. There are currently 256 platforms located in the WPA. It is unlikely that these additional 20 structures will create a significant hazard to navigation if regulations pertaining to adequate marking are adhered to and if locations are made known to mariners.

Conclusion

Increased vessel traffic expected in the peak year of activity and structures resulting from the proposed action indicate that impacts on affected ports and marine transportation will be moderate in subarea W-1 and low in W-2 and C-1.

Cumulative Impacts

The impact analysis for the proposal is based on expected increases in OCS-related vessel traffic over existing traffic levels in the WPA. These existing levels include all known potential impact producing factors, with the exception of the expected impacts associated with the exploration, development, and production of leased but undiscovered resources. Future OCS activities associated with prior sales and the proposed action are expected to increase vessel traffic levels in subarea W-1 by 24%, or 4,850 trips, in the peak year of combined activity (1987) over the 1982 level of 20,225. Traffic in subarea W-2 is expected to increase by 7%, or 10,050 trips, in the peak year over the 1982 level of 144,063. Traffic serving OCS activities in subarea W-3 is expected to increase by 6%, or 2,400 trips, in the peak year over the 1982 level of 41,134.

The development of infrastructure associated with prior OCS lease sales is expected to result in up to 50 additional platforms. These, combined with the 20 structures expected to result from the proposed action, indicate that up to 70 platforms will be emplaced in the WPA: 18 in W-1; 42 in W-2; and 11 in W-3. This 27% increase over the 256 structures currently located in the WPA could adversely impact navigation. The emplacement of the structures would be paced over a period of 13 years, which should alleviate the potential for serious impacts. The high levels of traffic utilizing the pass from the Gulf into Galveston Bay indicate that structures emplaced in this area could be a particular hazard to navigation. There is, however, a major safety fairway system in the area that should help prevent potential problems.

Conclusion

Increased vessel traffic, structures, and all other potential impact producing factors indicate that during the peak year of combined activity (1987) the cumulative impacts on ports and marine transportation will be high in subarea W-1 and moderate in W-2 and C-1.

b. Impacts from Alternative B - Delay Action

Impact Analysis

Delaying the sale is addressed as an alternative because delays have occurred in previous sales. While there are no specific issues in the WPA known at this time which might cause a delay, it is possible that a delay could occur for reasons that may arise before the sale is finalized.

Delaying the lease sale would withhold unleased blocks in the WPA for up to a 1-year period until the next Western Gulf sale is held, or until a later time period on the 5-year schedule. Western Gulf sales are scheduled annually. Historically, no extension date has been given and the basic assumption is that all impacts associated with the action would be delayed for a comparable period of time.

All impacts associated with the proposed action (as discussed above in Section II.B.1.) would be delayed until such time as the lease sale is reinstated.

Conclusion

If Sale 105 is delayed, all impacts will also be delayed for the same period of time.

Cumulative Impacts

Although the impacts of the proposed action would be delayed, the overall levels of cumulative impacts potentially caused by existing and future OCS leasing (excluding the proposed action) and other activities affecting the resources of concern are expected to be essentially the same as those summarized in Table S-3 and described in detail in Section IV.D.2.

c. Impacts from Alternative C - No Action

Impact Analysis

All positive and negative impacts associated with the proposed action (as discussed in Section IV.D.2.) would be cancelled.

The opportunity would be foregone or postponed for development of the 0.10 billion bbls of oil and 1.34 tcf of gas in the Western Gulf. Development of alternative energy supplies as replacement resources for lost domestic production is discussed in Section IV.D.1.d.

Based on the resources estimated by MMS, Table IV-50 presents the energy equivalents that may be required from several alternative energy sources should this sale be permanently cancelled. For the purpose of clarity, this table has separately identified each potential alternative source of energy regarding substitution requirements. It is unlikely, however, that there would be a single choice between these alternative sources, but instead, some combined effort to further explore and develop many or all of these forms as a substitute for OCS oil and gas production.

Conclusion

If no action is taken on this proposed sale, all environmental impacts that could have occurred under the proposed action will be avoided. Adverse socioeconomic impacts could include a loss of employment opportunities, payroll revenues, and tax revenues.

Cumulative Impacts

Although the impacts of the proposed action would not occur, the overall levels of cumulative impacts potentially caused by existing and future OCS leasing (excluding the proposed action) and other activities affecting the resources of concern are expected to be essentially the same as those summarized in Table S-3 and described in detail in Section IV.D.2.a.

d. Low, High, and Total Find Scenarios

(1) Description

(a) Low and High Find Scenarios (L and H Scenarios)

The L and H Scenarios are analyzed to provide information on the reasonably foreseeable range of potential exploration, development, and production activities and facilities, and related impacts that might occur as a result of the proposed action. The L Scenario is based on the low resource estimates for which there is a 95% chance that more than the amount estimated is present. The H Scenario is based on the high resource estimates for which there is a 5% chance that more than the amount estimated is present. These estimates are of the conditional, unleased, undiscovered, economically recoverable resources in the area being offered by the proposed action.

The resource recovery and offshore infrastructure estimates related to the proposed action are included in Table IV-1. The distribution of resources and infrastructure by subplanning area is included in Tables IV-4 and 5. Resource and related infrastructure estimates compared to those for the M Scenario, are 60%-75% less under the L Scenario and 50%-80% higher under the H Scenario.

The estimated timetables for offshore exploration, development, and production activity are included in Table IV-3. Exploration and development activity is estimated to occur over a somewhat shorter time period under the L Scenario, while under the H Scenario a somewhat longer time period is needed compared to the M Scenario estimates. Production activity would occur over an estimated 18-year period under both scenarios.

Transportation assumptions for the L and H Scenarios are the same as those described under the M Scenario.

New onshore facility use estimates are shown in Table IV-63. The estimated number of new facilities, compared to the M Scenario, is somewhat lower under the L Scenario and somewhat higher under the H Scenario.

(b) Total Find Scenario (T Scenario)

The T Scenario is used for the analysis of the impacts associated with continued OCS sales beyond the proposed action. This scenario is based on trends in the level of leasing and related resource recovery estimated for areawide lease sales. It assumes that recent trends will continue and hypothesizes the discovery, development, and production of the total undiscovered economically recoverable resources (mean conditional estimates) in the planning area as a result of the proposed action and subsequent OCS lease sales occurring over a 25-30 year period. Production resulting from future OCS sales is hypothesized to continue for about 40 years. This scenario is considered as a reasonably foreseeable, if not likely, event in view of the projected demand for hydrocarbon feedstocks and the effort to achieve the National goal of energy independence, in part, by increasing or maintaining Federal offshore hydrocarbon exploration, development, and production.

Resource and offshore infrastructure estimates for the T Scenario are presented in Table IV-64. The geographic extent and amount of acreage offered in the planning area is the same as for the M Scenario. The WPA contains estimated recoverable resources (mean conditional) of 1.65 billion bbls of oil and 22.57 tcf of natural gas. The estimated peak year amounts of offshore exploration, development, and production activity are also shown in Table IV-64.

The distribution of resources and related offshore infrastructure by subplanning area is shown in Table IV-65. The distribution is based on assumptions and estimates concerning the amounts and locations of undiscovered economically recoverable resources in each planning area.

It is estimated that oil and gas production will be connected to existing and new transmission lines (including 4-12 new pipeline landfalls) for transportation to existing and new processing facilities in Louisiana and Texas.

The major types and numbers of existing and new facilities estimated to be used in support of offshore development in the WPA, including their distribution by coastal subarea, are shown in Table IV-66.

Coastal subarea W-1 is estimated to be the location for several new service bases: 1-2 used for exploratory drilling; 1-2 used for development/production operations; and possibly one (0-1) used for pipeline installation. Additional new facilities are estimated to include: possibly one (0-1) pipe coating yard; 1-2 gas processing plants; 1-4 pipeline landfalls; and possibly one (0-1) platform fabrication yard. Likely potential locations for these new facilities include Cameron, Willacy, Kenedy (a possible pipeline landfall and a gas processing plant only), Nueces, San Patricio, Aransas, and Calhoun Counties.

Coastal subarea W-2 is estimated as the location for the following new onshore support facilities: possibly one (0-1) service base used for exploratory drilling; 1-2 service base used for development/production operations; possibly one (0-1) service base for pipeline installation; possibly one (0-1) pipe coating yard; 1-2 gas processing plants; 2-5 pipeline landfalls; and possibly one (0-1) platform fabrication yard. Likely potential locations for these new facilities include Brazoria, Galveston, Jefferson, and Matagorda Counties, except that no service bases are estimated for Matagorda County.

Coastal subareas C-1 and C-2 are expected to provide most onshore support for development in subplanning area W-3 and some for subplanning area W-2. Besides the use of existing facilities, the following new facilities are estimated: possibly one (0-1) service base for exploratory drilling; 1-2 service bases for development/production operations; 1-2 new pipeline landfalls; and possibly one (0-1) new gas processing plant. Likely potential sites for the new facilities include Cameron and Vermilion Parishes.

Table IV-63

Onshore Facility Use Estimates: Western Planning Area
(L and H Scenarios)

Facility	L Scenario	H Scenario
Service Base (Development/Production)	-	0-1[1]
Pipeline Landfalls	-	0-3[2]
Miles Onshore Pipeline	-	0-60[3]
Gas Processing Plant	-	0-1[4]

Notes: The following notes indicate the number of new facilities by coastal subarea (Figure IV-1):

[1] 0-1 in W-1 and 0-1 in W-2: likely potential locations are Cameron, Willacy, Nueces, San Patricio, Aransas, and Calhoun Counties in W-1; and Brazoria, Galveston, and Jefferson Counties in W-2.

[2] 0-1 in W-1 and 0-1 in W-2: likely potential locations are Cameron, Willacy, Kenedy, Nueces, San Patricio, Aransas, and Calhoun Counties in W-1; and Brazoria, Galveston, Jefferson, and Matagorda Counties in W-2.

[3] 0-20 in W-1 and 0-40 in W-2: same likely potential locations as indicated for the pipeline landfalls.

[4] 0-1 in W-2: likely potential locations are Matagorda, Brazoria, Galveston, and Jefferson Counties.

Source: USDI, MMS, Gulf of Mexico OCS Region estimates.

Table IV-64

Resource and Offshore Infrastructure Estimates: Western Planning Area (T Scenario)

	WPA
Resources Expected to be Developed[1]	
Oil (billion bbls)	1.64
Gas (tcf)	22.57
Offshore Infrastructure	
Exploration Wells[2]	3,600
Platforms[3]	290
Production Wells	2,880
Pipeline (miles)	2,150
Peak Year Activity[4]	
Exploration Wells Drilled[2] (no./yr.)	265/1993
Platforms Installed[3] (no./yr.)	21/1994
Production Wells Drilled (no./yr.)	210/1995
Oil Production (million bbls/yr.)	99/2002
Gas Production (billion cf/yr.)	1,354/2004

[1] Mean conditional estimates of the total unleased, undiscovered, economically recoverable resources (oil and gas expected to be discovered and produced).
[2] Includes delineation wells.
[3] Production.
[4] Only first year of multi-year peak periods is given.

Source: USDI, Minerals Management Service, Gulf of Mexico OCS Region estimates.

Table IV-65

Estimated Distribution of Resources and Offshore Infrastructure by Subplanning Area: Western Planning Area (T Scenario)

	W-1	W-2	W-3
Resources Recovered			
Oil (billion bbls)	0.44	0.89	0.32
Gas (tcf)	8.10	10.68	3.79
Infrastructure			
Exploration (1)	1,195	1,771	634
Platforms	92	146	52
Production Wells	916	1,446	518
Pipeline (miles)	670	900	580 (2)

(1) Includes delineation wells.
(2) Includes 240 miles in subplanning area C-1.

Source: USDI, Minerals Management Service, Gulf of Mexico OCS Region estimates.

Table IV-66

Onshore Facility Use Estimates: Western Planning Area (T Scenario)

	Total		Coastal Subarea W-1		Coastal Subarea W-2		Coastal Subarea C-1/C-2	
Facility	Existing	New	Existing	New	Existing	New	Existing	New
Service Bases								
Exploratory Drilling	9+	1-4	8+	1-2	6+	0-1	3+	0-1
Development/Production	11+	3-6	5+	1-2	3+	1-2	3+	1-2
Pipeline Installation	3+	0-2	1+	0-1	1+	0-1	1+	0
Pipe Coating Yard	3+	0-2	1+	0-1	1+	0-1	1+	0
Pipeline Landfall	3+	4-11	1+	1-4	1+	2-5	1+	1-2
Miles Onshore Pipeline	4+	40-220	1+	10-80	1+	20-100	1+	10-40
Marine Terminal	0	0	0	0	0	0	0	0
Platform Fabrication Yard	3+	0-2	1+	0-1	1+	0-1	2+	0
Gas Processing Plant	4+	2-5	1+	1-2	1+	1-2	2+	0-1
Refinery	3+	0	1+	0	1+	0	2+	0

Source: USDI, Minerals Management Service, Gulf of Mexico OCS Region estimates.

(2) Impact Analysis

(a) Impacts on Sensitive Coastal Habitats (Wetlands)

Low Find Scenario Impacts: In the WPA no onshore infrastructure development is projected. The Analysis indicates a low chance (13%) of one or more oil spills of 1,000 bbls or greater and several smaller spills contacting land within 10 days of the spill. Seagrass beds and marshes would be contacted in the event of a spill. Based on the analysis of impacts, the projected level of impact is very low in coastal subarea W-1, and low in coastal subareas W-2 and C-1/C-2.

High Find Scenario Impacts: In the WPA onshore infrastructure development consisting of up to 0-1 development/production facility, 0-60 miles of pipeline, and 0-1 gas processing plant could result in destruction of, alteration of, or interference with, up to 945 acres of sensitive coastal habitats. Impacts by coastal subareas could occur as follows: W-1 up to 315 acres and W-2 up to 630 acres. The maximum percentage of sensitive coastal habitats in any one coastal subarea affected could be up to 0.13% (W-2). The OSRA indictes a low chance (21%) of one or more spill of 1,000 bbls or greater and several smaller spills contacting land within 10 days of the spill. Marshes and seagrass beds are projected to be contacted should a spill occur. Based on the analysis of impacts, the projected level of impact is low in coastal subarea W-1, moderate in coastal subarea W-2, and low in coastal subarea C-1/C-2.

Total Find Scenario Impacts: One oil spill of 1,000 bbls or more and several smaller spills may contact vulnerable sensitive coastal habitats. The counties with a reasonably foreseeable potential to be contacted by one or more of these spills are identified in the list that follows: coastal subarea W-1, Nueces - 1 (14%); Kleberg - 1 (10%); and Kenedy - 1 (15%); and coastal subarea W-2, Matagorda - 1 (7%); Brazoria - 1 (13%); Galveston/Chambers - 1 (33%). Other coastal subareas would not be contacted by an oil spill related to OCS development in the WPA. Cumulatively, a maximum of two spills (67%) could be expected to contact land in the WPA. Additionally, an undetermined number of spills of less than 1,000 bbls could occur and possibly contact sensitive coastal habitats.

In coastal subarea W-1, a number of new OCS support/processing facilities are estimated that could cause impacts to sensitive coastal habitats (Table IV-66). Up to four oil/gas transmission pipelines are estimated. One could make landfall at Port Isabel (Cameron County), one at Port Mansfield (Willacy County), one at Sarita (Kenedy County), two at Corpus Christi (Nueces County), two at Aransas Pass (San Patricio County), one at Rockport (Aransas County), and one at Port Lavaca (Calhoun County). No sensitive coastal habitats would likely be impacted by a pipeline making landfall at Port Isabel. Up to 18 acres of seagrass beds could be destroyed by a pipeline making landfall at Port Mansfield. No wetlands would likely be impacted by a pipeline to Sarita. No wetlands would likely be impacted by one or two pipelines to Corpus Christi; up to 60 acres of seagrass beds could be destroyed by two pipelines to Aransas Pass; up to 6 acres of seagrass beds could be temporarily destroyed by a pipeline to Rockport; and up to 60 acres of wetlands and 6 acres of seagrass beds could be destroyed by a pipeline to Port Lavaca unless the pipeline is laid in Matagorda Bay and Lavaca Bay. Consequently, up to 144 acres of sensitive coastal habitats could be destroyed by four pipelines making landfall in this coastal subarea. Additionally, a number of onshore support facilities could be constructed. If located in wetland areas, these estimated facilities could result in the destruction of up to 485 acres of wetlands, as follows: 2-5 service bases, up to 185 acres; 0-1 pipe coating yard, up to 150 acres; and 1-2 gas processing plants, up to 150 acres; and 0-1 platform fabrication yard, up to 400 acres. This, including pipeline impacts, gives a total maximum sensitive coastal habitat loss of 1,029 acres, which represents 0.2% of these habitats in coastal subarea W-1. The estimated impact in coastal subarea W-1 is moderate.

In coastal subarea W-2, a number of new OCS support/processing facilities are estimated that could cause impacts to sensitive coastal habitats (Table IV-66). Up to five oil/gas transmission pipelines are estimated. One pipeline could make landfall at Palacios (Matagorda County), one at Freeport (Brazoria County), one at Angleton (Brazoria County), one at Galveston (Galveston County), one at Texas City (Galveston County), and one at Port Arthur (Jefferson County). A pipeline making landfall at Palacios could destroy up to six acres of seagrass beds. The Freeport pipeline could destroy up to 36 acres of wetlands, and the Angleton pipeline could destroy up to 60 acres of wetlands. The Galveston pipeline would likely impact nine acres of wetlands. The Texas City pipeline could permanently destroy up to 48 acres of wetlands. The Port Arthur pipeline could permanently destroy up to 180 acres of wetlands. Consequently, up to 330 acres of sensitive coastal habitats could be destroyed by five pipelines making landfall in this coastal subarea. Additionally, a number of onshore support facilities could be constructed in this coastal subarea. If located in wetlands areas, these estimated facilities could result in the destruction of up to 869 acres of wetlands, as follows: 1-5 service bases, up to 169 acres; 0-1 pipe coating yard, up to 150 acres; 1-2 gas processing plants, up to 150 acres; and 0-1 platform fabrication yard, up to 400 acres. Using the maximum expected wetlands losses due to pipeline construction of 330 acres, the total loss of sensitive coastal habitats in coastal subarea W-2 amounts to a maximum of 1,199 acres. This represents a loss of 0.2% of these habitats in coastal subarea W-2. The estimated impact in coastal subarea W-2 is moderate.

(b) Impacts on Sensitive Offshore Habitats

Low Find Scenario Impacts: Table IV-1 indicates this scenario envisions the possibility of considerable activity in the WPA up to: 120 exploration and delineation wells; 6 platforms; 60 development wells; and 40 miles of pipelines. To the extent that these activities take place on the sensitive habitats of the WPA, the impacts to these habitats could be very high. However, the imposition of the biological stipulations will reduce these potential impacts to very low (Section IV.D.2.a.(2)).

High Find Scenario Impacts: Table IV-1 indicates this scenario envisions the possibility of considerable activity in the WPA up to: 580 exploration and delineation wells; 30 platforms; 310 development wells; and 260 miles of pipelines. To the extent that these activities take place on the sensitive habitats of the WPA, the impacts to these habitats could be very high. However, the imposition of the biological stipulations will reduce these potential impacts to very low (Section IV.D.2.a.(2)).

Total Find Scenario Impacts: Table IV-1 indicates this scenario envisions the possibility of considerable activity in the WPA up to: 3,600 exploration and delineation wells; 290 platforms; 2,880 development wells; and 2,150 miles of pipelines. To the extent that these activities take place on the sensitive habitats of the Western Gulf, the impacts to these habitats could be very high. However, the imposition of the biological stipulation, if it continues to be imposed, will reduce these potential impacts to very low (Section IV.D.2.a.(2)).

(c) Impacts on Water Quality

Low Find Scenario Impacts: Under this scenario, the discharge of an estimated 0.0003-0.027 billion bbls of formation waters, 0.546 million bbls of drilling muds, 0.061 million yds^3 of drill cuttings, 0.015 million bbls of sand from drilling operations, and an average of 0.026 Mgal/day of treated sanitary and domestic wastes from platforms may be expected. Pipeline-related activities would result in the disturbance of some 0.092-0.240 million yds^3 of sediment.

Offshore and nearshore waters will be subject to impacts from discharges of drilling fluids, formation waters, and other effluents which add burdens of both toxic and nontoxic materials to the water column. However, the natural processes of dispersion, degradation, and sedimentation will result in immeasurably low concentrations of these materials within a few meters to a few kilometers of the discharge site, resulting in low impacts.

Discharge from onshore support facilities is estimated to be minimal with impacts to onshore water quality expected to be very low.

High Find Scenario Impacts: Under this scenario, the discharge of an estimated 0.0018-0.162 billion bbls of formation waters, 2.639 million bbls of drilling muds, 0.296 million yds^3 of drill cuttings, 0.09 million bbls of sand from drilling operations, and an average of 0.132 Mgal/day of treated sanitary and domestic wastes from platforms may be expected. Pipeline-related activities would result in the disturbance of some 0.59-1.56 million yds^3 of sediment.

Offshore and nearshore waters will be subject to impacts from discharges of drilling fluids, formation waters, and other effluents which add burdens of both toxic and nontoxic materials to the water column. However, the natural processes of dispersion, degradation, and sedimentation will result in immeasurably low concentrations of these materials within a few meters to a few kilometers of the discharge site, resulting in low impacts.

Discharge from onshore support facilities is estimated to be minimal with impacts to onshore water quality expected to be very low. These impacts may stem from the construction and operation of OCS onshore support facilities, up to 0-1 new gas processing plant, up to 0-60 miles of onshore pipelines, and up to 0-1 new service base projected for the WPA.

Total Find Scenario Impacts: Under this scenario, the discharge of an estimated 0.016-1.48 billion bbls of formation waters, 16.38 million bbls of drilling muds, 1.84 million yds^3 of drill cuttings, 0.825 million bbls of sand from drilling operations, and an average of 1.21 Mgal/day of treated sanitary and domestic wastes from platforms may be expected. Pipeline-related activities would result in the disturbance of some 4.94-12.90 million yds^3 of sediment.

Offshore and nearshore waters will be subject to impacts from discharges of drilling fluids, formation waters, and other effluents which add burdens of both toxic and nontoxic materials to the water column. However, the natural processes of dispersion, degradation, and sedimentation will result in immeasurably low concentrations of these materials within a few meters to a few kilometers of the discharge site, resulting in low impacts.

Discharge from onshore support facilities is estimated to be minimal with impacts to onshore water quality expected to be very low. These impacts may stem from the construction and operation of OCS onshore support facilities, up to 2-5 new gas processing plants, up to 0-2 new pipe coating yards, up to 40-220 miles of onshore pipelines, and up to 4-10 new service bases projected for the WPA.

(d) Impacts on Air Quality

Low Find Scenario Impacts: Estimates for the WPA include no new gas processing plants and no new or expanded refineries needed. It is expected that up to 120 exploratory and delineation wells, 60 development/production wells, and 6 platforms will be utilized. New activity is expected to be near evenly distributed throughout the WPA with subplanning area W-2 having the most expected activity. The overall impact on coastal air quality is expected to be low in any nearby coastal area where an uncontrolled sour gas blowout occurs. Low impacts are expected in Cameron, Nueces, Galveston, Jefferson, and Brazoria Counties in Texas. Very low impacts are expected throughout the remainder of the coastal area of the Western Gulf.

High Find Scenario Impacts: Estimates for the WPA include possibly one (0-1) new gas processing plant and no new or expanded refineries needed. The locations of the new gas processing plant is expected to be located in coastal subarea W-2. It is expected that up to 580 exploratory and delineation wells, 310 development/production wells, and 30 platforms will be utilized. New activity is expected to be near evenly distributed throughout the WPA with subplanning area W-2 having the most expected activity. The overall impact on coastal air quality is expected to be low to moderate in any nearby coastal area where an uncontrolled sour gas blowout occurs. Low impacts are expected in Cameron, Nueces, Galveston, Jefferson, and Brazoria Counties in Texas. Very low impacts are expected throughout the remainder of the coastal area of the Western Gulf.

Total Find Scenario Impacts: The total development scenario estimates from the WPA include between two and five new gas processing plants and no new or expanded refineries needed. The locations of the new gas processing plants are expected to be located somewhere in coastal subareas W-1 and W-2.

Should total development of the Western Gulf occur, it is expected that up to 3,600 exploratory and delineation wells, 2,880 development/production wells, and 290 platforms will be utilized. Presently, there are approximately 256 structures in the Western Gulf. New activity is expected to be near evenly distributed throughout the Western Gulf with subplanning area W-2 having the most expected activity. A total of up to 320 platforms are projected as a result of this and future sales. Impacts are expected to be low to moderate. Moderate impacts are expected adjacent to areas where offshore activity is highly concentrated (subareas W-1 and W-2) and low in areas adjacent to minimal activity (subarea W-3).

(e) Impacts on Endangered and Threatened Species

Low Find Scenario Impacts: The OSRA indicates a negligible probability (1%) of one or more OCS-related oil spills greater than 1,000 bbls occurring and contacting sea turtles nesting along the Texas coast; one oil spill greater than 1,000 bbls and several smaller spills are expected to occur and contact land. With this negligible probability of contact, it is unlikely this scenario would have an adverse impact on sea turtles along the Texas coast.

OCS-related vessel traffic in the WPA is estimated to increase less than 1%. The level of vessel collisions with sea turtles in the WPA is unknown; however, no injuries or mortalities have been reported or documented.

No projected pipeline facility construction is expected to occur in the vicinity of marine turtle nesting beaches in the WPA as a result of this scenario.

A very low level of impact on sea turtles from potential OCS-related oil spills, collisions with OCS-related support vessels, and pipeline construction is expected in this area as a result of this scenario.

Analysis indicates a low probability (1%) of one or more spills greater than 1,000 bbls occurring and contacting brown pelican nesting habitat along the Texas coast; one oil spill greater than 1,000 bbls and several smaller spills are expected to occur and contact land. It is unlikely this scenario would have an adverse impact on brown pelicans along the Western Gulf coast.

The brown pelican is susceptible to disturbance and habitat alteration of nesting areas; this may cause nest desertion and egg losses. Aircraft and vessel traffic in the Western Gulf is estimated to increase less than 1%.

No onshore facility construction is expected to occur in the vicinity of brown pelican nesting habitat in the WPA as a result of this scenario.

A very low level of impact on brown pelicans from potential OCS-related oil spills, aircraft/vessel traffic, and coastal construction is expected in the WPA as a result this scenario.

High Find Scenario Impacts: The OSRA estimates a negligible probability (1%) of one or more OCS-related oil spills greater than 1,000 bbls occurring and contacting sea turtles nesting along the Texas coast; one oil spill greater than 1,000 bbls and several smaller spills are expected to occur and contact land. With this very low incidence of occurrence, it is unlikely this scenario would have an adverse impact on sea turtles along the Western Gulf coast.

OCS-related vessel traffic in the WPA is estimated to increase less than 5%. The level of vessel collisions with sea turtles in the WPA is unknown; however, no injuries or mortalities have been reported or documented.

One potential development/production service base and up to three pipeline landfalls may be required in the WPA as a result of the proposed action. It is unlikely any of this onshore construction will occur near a sea turtle nesting beach in the WPA.

A very low level of impact on sea turtles from potential OCS-related oil spills, collisions with OCS-related support vessels, and pipeline construction is expected in this area as a result of this scenario.

The OSRA estimates a very low probability (10%) of one or more spills greater than 1,000 bbls occurring and contacting brown pelican nesting habitat along the Texas coast; oil spill greater than 1,000 bbls and several smaller spills are expected to occur and contact land. It is unlikely this scenario would have an adverse impact on brown pelicans along the southwestern Gulf coast.

The brown pelican is susceptible to disturbance and habitat alteration of nesting areas which may cause nest desertion and egg losses. Aircraft and vessel traffic in the Western Gulf is estimated to increase less than 5%.

It is estimated that one development/production service base and up to three pipeline landfalls may be required in the WPA as a result of this scenario. This onshore construction could impact brown pelican nesting and feeding habitat in Nueces, Kleberg, Kenedy, Willacy, or Cameron Counties in Texas.

A low level of impact on brown pelicans from potential OCS-related oil spills, aircraft/vessel traffic, and coastal construction is expected in the Western Gulf as a result of this scenario.

Total Find Scenario Impacts: In the event that all the estimated hydrocarbon resources in the WPA are developed, two oil spills greater than 1,000 bbls and several smaller spills are expected, with a moderate probability (30%) of occurring and contacting endangered species habitats. These potential spills are expected to cause a low level of impact on endangered and threatened species.

Increased OCS-related aircraft and vessel traffic is about 5% of existing and projected commercial and recreational aircraft/vessel traffic in this area. About 40% of this non-OCS-related aircraft and vessel traffic is in coastal areas inhabited by sea turtles and brown pelican habitat. This could increase the probability of vessel collisions with turtles and disturbance of pelican nesting areas. This potential increased aircraft and vessel traffic is expected to have a low level of impact on endangered and threatened species in the Western Gulf.

Expanded and new onshore facilities in the WPA are listed in Table IV-66. This estimated OCS-related construction would require less than 3% of the remaining coastal acreage suitable for endangered and threatened species habitat that currently is being used for non-OCS-related commercial and residential structures in the coastal zone. This potential onshore construction is expected to have a low level of impact on endangered and threatened species or their habitat in the WPA.

As a result of this scenario, the overall impacts on endangered and threatened species or their habitat in the Western Gulf are expected to be low.

(f) Impacts on Marine Mammals

Low Find Scenario Impacts: The OSRA indicates a negligible probability (6%) of an oil spill greater than 1,000 bbls occurring and contacting nearshore water areas in the WPA; one spill greater than 1,000 bbls and several smaller spills are expected. Taking this into consideration, it is unlikely that OCS-related oil spills will affect marine mammals in the WPA as a result of this scenario.

Vessel traffic in the WPA is estimated to increase less than 1%. The level of vessel collisions with marine mammals in the WPA is unknown; however, no injuries or mortalities have been reported or documented.

About 180 wells will be drilled, and some seismic exploration will be required over the assumed 18- to 20-year period of this scenario. The effect of this disturbance to marine mammals is unknown; however, because it is usually short-term and fairly localized, it is unlikely to cause a major impact on marine mammals in the WPA as a result of this scenario.

It is expected that OCS-related oil spills, collisions with OCS-related vessel traffic, and disturbance from OCS-related oil/gas activities will have a very low level of impact on marine mammals and their habitat in the Western Gulf as a result of this scenario.

High Find Scenario Impacts: The OSRA estimates a low probability (21%) of an oil spill greater than 1,000 bbls occurring and contacting nearshore water areas in the WPA; one spill greater than 1,000 bbls and several smaller spills are expected to occur. Considering this low incidence of occurrence, it is unlikely that this scenario will affect marine mammals in the WPA.

Vessel traffic in the WPA is estimated to increase less than 5%. The level of vessel collisions with marine mammals in the WPA is unknown; however, no injuries or mortalities have been reported or documented.

About 890 wells will be drilled, and some seismic exploration will be required over the assumed 18- to 20-year period of the proposed action. The effect of this disturbance to marine mammals is unknown; however, because it is usually short-term and fairly localized, it is unlikely to cause a major impact on marine mammals in the WPA as a result of this scenario.

It is expected that OCS-related oil spills, collisions with OCS-related vessel traffic, and disturbance from OCS-related oil/gas activities will have a very low level of impact on marine mammals and their habitat in the Western Gulf as a result of this scenario.

Total Find Scenario Impacts: In the event that all of the estimated hydrocarbon resources in the WPA are developed, two oil spills greater than 1,000 bbls and several smaller spills are expected, with a high probability (64%) of occurring and contacting marine mammal habitat. These potential oil spills are expected to have a low level of impact on marine mammals.

Vessel traffic in the WPA is estimated to increase less than 5%. This increased OCS-related vessel traffic is less than 5% of the existing and projected commercial and recreational vessel and barge traffic in this area. About 70% of this non-OCS-related vessel traffic is in nearshore areas inhabited by marine mammals; this would increase the possibility of vessel collisions with these animals. This potential increased vessel traffic is expected to cause a low level of impact on marine mammals in the WPA.

About 6,480 wells may be drilled and seismic exploration will occur on the blocks offered for lease over the assumed 40- to 42-year period of total development. The majority of this disturbance and noise is usually short-term and localized, and the impact is believed to be low.

As a result of this scenario, the overall impact on marine mammals in the Western Gulf is expected to be low.

(g) Impacts on Coastal and Marine Birds

Low Find Scenario Impacts: The OSRA indicates a negligible probability (6%) of one or more oil spills greater than 1,000 bbls occurring and contacting coastal areas. One oil spill greater than 1,000 bbls and several smaller spills are expected to occur. Considering the low possibility of OCS oil spills in this area, it is unlikely that coastal and marine birds in the WPA will be affected as a result of this scenario.

Disturbance of coastal and marine birds nesting and feeding habitat from onshore construction and associated noise from air vessel traffic could result in a reduction or elimination of birds that use the habitat for feeding or nesting. Dredging and the construction of pipelines and roads could change water flows that may result in the complete conversion of a marsh ecosystem.

No onshore facility construction is expected to occur in the vicinity of coastal and marine bird feeding or nesting habitat in the WPA as a result of this scenario.

A very low level of impact on coastal and marine birds from potential OCS-related oil spills and disturbance from onshore construction is expected in the WPA as a result of this scenario.

High Find Scenario Impacts: The OSRA estimates a low probability (21%) of one or more spills greater than 1,000 bbls occurring and contacting coastal areas in the WPA. One oil spill greater than 1,000 bbls and several smaller spills are expected to occur. Considering the low possibility of OCS oil spills in this area as a result of this scenario, it is unlikely that OCS-related oil spills will affect coastal and marine birds in the WPA.

Disturbance of coastal and marine birds nesting and feeding habitat from onshore construction and associated noise from air vessel traffic could result in a reduction or elimination of birds that use the habitat for feeding or nesting. Dredging and the construction of pipelines and roads could change water flows that may result in the complete conversion of a marsh ecosystem.

It is estimated that one development/production service base and up to three pipeline landfalls may be required in the WPA as a result this scenario. This onshore construction could impact coastal and marine bird feeding and nesting habitat.

A low level of impact on coastal and marine birds from potential OCS-related oil spills and disturbance from onshore construction is expected in the WPA as a result of this scenario.

Total Find Scenario Impacts: In the event that all estimated hydrocarbon resources in the WPA are developed, two oil spills greater than 1,000 bbls and several smaller spills are expected, with a high probability (64%) of occurring and contacting coastal and marine bird habitat. These potential oil spills are expected to result in a low level of impact on coastal and marine birds.

Expanded and new onshore facilities in the WPA are listed in Table IV-66. This potential onshore construction is expected to cause a low level of impact on coastal and marine birds in the WPA.

As a result of total OCS oil/gas development and other activities, the overall impact on coastal and marine birds and their habitat in the Western Gulf area is expected to be low.

(h) Impacts on the Commercial Fishing Industry

Low Find Scenario Impacts: Six offshore platforms/structures are expected in the WPA, eliminating less than 0.1% (18-30 acres) of trawling area. Of these six offshore platforms/structures, two are expected for Analysis Areas W-1, three for W-2, and one for W-3. Fishermen would absorb some economic loss through gear conflicts. A very low impact is expected on the commercial fishing industry.

High Find Scenario Impacts: Thirty offshore platforms/structures are expected in the WPA, eliminating less than 0.1% (90-150 acres) of trawling area. Of these 30 offshore platforms/structures, 7 are expected for Analysis Areas W-1, 19 for W-2, and 4 for W-3. The OSRA indicates that one oil spill greater than 1,000 bbls and several smaller spills originating in the WPA could contact Galveston Bay within 10 days of the spill.

If an oil spill greater than 1,000 bbls contacts the open bays in any of the analysis areas within 10 days of the spill, severe medium-term (1-3 years in duration) consequences could occur on the invertebrate and vertebrate fisheries, and fishing could be deterred. Another offshore oil spill greater than 1,000 bbls could occur in the WPA that is not expected to contact any open bays. As a result of one or more of these offshore spills, fish eggs, larvae, and juveniles could be destroyed, and localized fishing could be disrupted in the WPA, as well as in the Central or Eastern Planning Areas, if they are contacted by one or more of the spills.

A high impact is expected on the commercial fishing industry.

Total Find Scenario Impacts: There are 151 platforms/structures in Analysis Area W-1, and 92 are expected for this scenario, eliminating less than 0.1% (729-1,215 acres) of the trawling area. There are no open bays in this analysis area to be impacted by an offshore oil spill.

There are 288 platforms/structures in Analysis Area W-2, and 146 are expected for this scenario, eliminating less than 0.1% (1,302-2,170 acres) of the trawling area. The oil spill model indicates that one oil spill greater than 1,000 bbls and several smaller spills could contact Galveston Bay in this analysis area within 10 days of the spill. The commercial catch in the inshore portion of this analysis area is approximately 18.6 million lbs/yr worth $17.5 million.

There is no platform/structure in Analysis Area W-3, and 52 are expected for this scenario, eliminating less than 0.1% (156-260 acres) of the trawling area. There are no open bays in this analysis area to be impacted by an oil spill.

If one or more of the open bays is contacted by an offshore oil spill greater than 1,000 bbls within ten days of the spill, severe medium-term (1-3 years in duration) consequences could occur on invertebrate and vertebrate fisheries and fishing could be deterred. Another offshore oil spill greater than 1,000 bbls could occur in the WPA that is not expected to contact any open bays. As a result of one or more of these offshore spills, fish eggs, larvae, and juveniles could be destroyed, and localized fishing could be disrupted in the WPA, as well as in the Central or Eastern Planning Areas if they are contacted by one or more of the spills.

Waters of the WPA could be contacted by 648 oil spills from 1-999 bbls, with some possibly reaching State waters. These spills could result in localized short-term effects on fisheries resources.

(i) Impacts on Offshore Marine Recreational Fishing

Low Find Scenario Impacts: As noted in Table IV-1, only six new production platforms would be required offshore to produce the estimated discoveries. All these structures will function as de facto artificial reefs, and if they are located within 25 miles of Galveston, Freeport, Port Aransas, or Port Isabel, they are likely to attract some fishermen and cause a low impact on fishing.

High Find Scenario Impacts: Table IV-1 indicates 30 new production platforms in the WPA. All these structures will function as de facto artificial reefs, and several are likely to be within 25 miles of major recreational fishing ports. Those structures accessible to the private boats and charter boats will enhance recreational fishing, thereby causing a moderate impact.

Total Find Scenario Impacts: Table IV-40 indicates 290 additional offshore platforms in the WPA. This many additional structures would increase by over 100% the number of platform de facto artificial reefs currently on the OCS and add significantly to the 450 platforms and artificial reefs currently in the WPA. The location of these structures will cause a high impact on offshore marine recreational fishing off the Texas coast.

(j) Impacts on Major Shorefront Recreational Beaches

Low Find Scenario Impacts: No major spills are likely to occur and contact recreational beaches; therefore, there would be little, if any, adverse impact to shorefront recreational beaches. Some debris and trash associated with exploratory operations may wash upon recreational beaches. The expected impacts would be low.

High Find Scenario Impacts: Analysis indicates there is a reasonably foreseeable potential for one oil spill contact (18%) to occur in the WPA. Galveston Island beaches are most likely to be adversely affected should such a spill occur. Debris and trash associated with offshore operations is likely to cause intermittent aesthetic and maintenance problems on Texas beaches. The expected impacts would be low to moderate on affected beaches.

Total Find Scenario Impacts: Table IV-20 indicates there is a reasonable probability (57%) that at least one major oil spill and several smaller spills resulting from OCS leasing will occur and impact a major recreational beach in the WPA. Beaches on Galveston Island and Padre Island National Seashore are most vulnerable to the pollution risk in the WPA as a result of this scenario. Recreational use will be temporarily displaced from the areas directly impacted (1 week to 2 months) and beach sands may require cleaning or disposal and replacement. Debris on beaches, a chronic problem associated with the multiple uses of the Gulf of Mexico, is likely to increase. The expected impacts would be low to moderate on affected beaches.

(k) Impacts on Cultural Resources

Low Find Scenario Impacts: The projected offshore development from this scenario would be approximately 32% of that projected under the Most Likely Find Scenario. Assuming an interaction occurs between an archaeological site and an impact producing factor, the impact levels would be moderate to very high; however, the risk of these impacts occurring would be reduced about 32%.

There is no projected onshore development as a result of this scenario. Therefore, the expected impact to archaeological sites would be very low.

There is a negligible chance (5%) of an oil spill of 1,000 bbls or greater contacting a coastal archaeological site. Therefore, although the impacts would be low to very high depending on the type of site contacted and the uniqueness of the data lost, the already low risk of these impacts occurring would be lower than under the M Scenario.

High Find Scenario Impacts: The projected offshore development from this scenario would be approximatley 69% greater than that projected under the Most Likely Find Scenario. Assuming an interaction occurs between an archaeological site and an impact producing factor, the impact levels would be moderate to very high; however, the risk of these impacts occurring would be increased by about 69%.

The projected onshore development from this scenario would be approximately three times higher than that projected under the M Scenario. Assuming an interaction occurs between an archaeological site and an impact producing factor, the impact levels would be moderate to very high; however, the risk of these impacts occurring would be increased about three-fold when compared to the M Scenario.

There would be a 9% chance of an oil spill of 1,000 bbls or greater contacting a coastal archaeological site. Therefore, although the impacts would be low to very high depending on the type of site contacted and the uniqueness of the data lost, the risk of these impacts occurring would be doubled when compared to the Most Likely Find Scenario.

Total Find Scenario Impacts: The projected offshore development from this scenario would be about 11 times higher than that projected under the M Scenario. Assuming an interaction occurs between an archaeological site and an impact producing factor, the impact levels would be moderate to very high; however, the risk of these impacts occurring would be about 11 times higher than the Most Likely Find Scenario.

The projected onshore development from this scenario would be about 14 times higher than that projected under the Most Likely Find Scenario. Assuming an interaction occurs between an archaeological site and an impact producing factor, the impact levels would be moderate to very high; however, the risk of these impacts occurring would be about 14 times higher than under the M Scenario.

There is a low chance (28%) of an oil spill of 1,000 bbls or greater contacting a coastal archaeological site. Therefore, although the impacts would be low to very high depending on the type of site contacted and the uniqueness of the data lost, the risk of these impacts occurring would be increased about six-fold when compared to the Most Likely Find Scenario.

(l) Impacts on Tourist Activity/Industry

Low Find Scenario Impacts: The likelihood that any recreational beach would be contacted by an oil spill is negligible for this scenario. This absence of spills will result in no effects on tourism activity from the proposed action.

There will be no impact from this scenario on tourism activity in the Western Gulf region.

High Find Scenario Impacts: The expected number of spill contacts (1,000 bbls or more within 10 days) with Western Gulf beaches that are important for tourism is negligible according to the OSRA. The coastal areas that have a discernible chance (0.5% or greater) of being contacted by an oil spill are in Kleberg, Nueces, Brazoria, and Galveston Counties in Texas. Such a spill contact with the beaches in these counties could cause tourism losses as follows: Kleberg - $0.5 million (2.5%); Nueces - $40 million (15.0%); Brazoria - $8.2 million (12.5%); and Galveston - $26.2 million (12.4%). This level of impact on tourism activity would be considered very low in Kleberg County and moderate in the remaining areas.

The probability that such a spill contact would occur is very low, as follows: Kleberg - 1%; Nueces - 1%; Brazoria - 5%; and Galveston - 12%. Therefore, a spill contact is considered unlikely.

There are no expected impacts from this scenario on tourism activity in the WPA.

Total Find Scenario Impacts: Tourism activity in the Texas coastal region is expected to be measurably affected by future WPA OCS activity. Estimates of expected average annual losses in these areas were determined in the same manner previously discussed for the CPA.

The expected number of spill contacts (1,000 bbls or greater within 10 days) with Western Gulf beaches that are important for tourism is estimated by the OSRA at 1.0 for the proposed action. The coastal areas that have a discernible chance (0.5% or greater) of being contacted by spills are as follows: Cameron, Kenedy, Kleberg, Nueces, Brazoria, Galveston, and Jefferson Counties in Texas. Of these, Kenedy County reportedly has no tourism expenditures. One spill contact with the recreational beaches in these areas would cause total tourism losses during the year of the spill as follows: Cameron - $92.4 million (32%); Kleberg - $0.5 million (2.5%); Nueces - $40.0 million (15%); Brazoria - $8.2 million (12.5%); Galveston - $26.2 million (12%);

and Jefferson - $5.1 million (3%). The effect of tourism expenditures would range from very low to very high in the various counties during the year of the spill.

The probability that such a spill contact would occur is as follows: Cameron - 7%; Kenedy - 6%; Kleberg - 7%; Nueces - 14%; Brazoria - 13%; Galveston - 33%; and Jefferson - 1%. Therefore, a spill contact is considered unlikely.

There are no expected impacts from this scenario on tourism activity in the WPA.

(m) Impacts on Military Use/Warning Areas

Low Find Scenario Impacts: For this scenario, the lowest number of wells anticipated being drilled in W-228 would be 18, with 1 platform installation. There are 12 platforms existing within W-228, which already present some conflict with Naval carrier operations, and the additional platform in place and a possible one to two exploration rigs per year would cause a high level of impact on continuing Naval operations.

Within W-602, the lowest number of wells anticipated for this scenario would be 20, with 1 platform installation. With the low intensity and frequency of USAF operations indicated in W-602 and the concentration of oil and gas activities in the northern one-third of the warning area, the level of impact should remain low.

High Find Scenario Impacts: For this scenario, the highest number of wells projected to be drilled in W-228 would be 86, with 4 platform installations. There are 12 platforms existing within W-228, which already present some conflict with Naval carrier operations, and the additional 4 platforms in place and a possible 3 to 5 exploration rigs per year would cause a continuation of a high level of impact on Naval operations.

Within W-602, the highest number of wells anticipated for this scenario would be 99, with 6 platforms installations. With the low intensity and frequency of USAF operations indicated in W-602, and the concentration of oil and gas activities in the northern one-third of the warning area, the level of impact should remain as low.

Total Find Scenario Impacts: This scenario relates to oil and gas development from past sales, development as a result of the proposed action, and development resulting from future leasing. The major impact producing factors to be reviewed are the number and locations of platforms and the number of exploratory wells yet to be drilled. The number of exploratory wells and the numbers of platforms influence the number of service boat and helicopter trips into the warning areas.

At present, there are approximately 12 platforms within warning area 228, 6 platform installations were proposed as a result of Sales 74, 84, and 102, and 50 platform installations are proposed as a result of future lease sales. By the year 2010, the total number of platforms within W-228 could be 68. This is an increase of 566% over the present number. Because of the location of the resources most likely to be developed offshore of South Texas (see Visual No. 13 for the areas of high and moderate interest), most of these platforms will be located in the western half of W-228 within 100 miles of shore. Also, due to the geology and likelihood that natural gas will be the predominant find within the area, the platforms will be dispersed rather than concentrated.

From 1985 to 2010, 693 exploratory wells are predicted to be drilled within W-228. The peak exploration is expected to be in 1990 in W-228 with 34 wells. This means a maximum of 11 drilling rigs in any year in W-228. The locations of these rigs is likely to be scattered throughout the western half of the warning area.

The drilling rigs and platforms will generate a maximum of 7,072 trips by service boats when all platforms are installed in 2010, as well as nearly 49,640 helicopter trips per year. For military activities within W-228, these service vessel and helicopter trips could pose operational problems.

At present, W-602 has 21 platforms located within it, 4 platform installations were projected to result from Sale 74, 2 platform installations are projected from Sale 84, 2 platform installations were proposed lease Sale 102, and 45 platform installations are predicted to result from future leasing. By the year 2010, the total number of platforms within W-602 could be 72.

This is an increase of 342% over the present number. Because of the location of the resources most likely to be developed (see Visual No. 13 for the areas of high and moderate interest) and the water depths within the area, most of these 72 platforms will be located in the northern one-third of W-602. Also, due to the geology of the oil and gas reservoirs in this region of the OCS, the platforms will be more clustered around the structural traps.

From 1985 to 2010, 567 exploratory wells are predicted to be drilled within W-602. The peak exploration (28 wells) is expected to be in 1990 in W-602. This means the maximum number of drilling rigs within the period 1985-2010 for any single year will be nine. The locations of these rigs is likely to be scattered throughout the northern half of W-602.

The drilling rigs and platforms will generate a maximum of 7,488 trips by service boats when all platforms are installed in 2010, as well as nearly 52,560 helicopter trips. For military activities within W-602, these service vessels and helicopter trips could pose operational problems.

By the year 2010, the impact of the proposed action on military activities within W-228 will be high, and in W-602 it will be moderate.

(n) Impacts on Water Supply

Mitigation of water supply-related impacts would require prudent site selection of onshore support facilities in areas known to possess ample surface and groundwater supplies currently, and with water resouce conservation and development for the future.

Low Find Scenario Impacts: No new service bases or gas processing plants will be constructed as a result of the proposed action in the WPA. As a result of this, the impacts to the regional water supply are expected to be very low.

High Find Scenario Impacts: The addition of up to one new service base and one new gas processing plant will impact area water supplies as a result of future OCS-related activities in the WPA. As a result of this, the impacts to the regional water supply are expected to be moderate, with the supply of up to two areas being noticeably affected and stressing existing resources.

Total Find Scenario Impacts: The addition of up to 10 new service bases and 5 new gas processing plants will impact area water supplies as a result of future OCS-related activities in the WPA. As a result of this, the impacts to the regional water supply are expected to be high, with the supplies of several areas being substantially affected and requiring modification of existing facilities.

(o) Impacts on Local Employment, Income, and Population

Low Find Scenario Impacts: This scenario is expected to generate a lesser level of employment in the Gulf coastal region than the Most Likely Find Scenario. The new resident activity, however, will be the same as under the M Scenario, since in both cases the new resident activity occurs only in 1987, and the levels of new resident employment, payroll, and population in that year are practically equal. The main difference between the Low Find Scenario and the Most Likely Find Scenario is that proposed lease Sale 105-related activity will occur over fewer years and will maintain less of the cumulative peak year (1987) employment in later years. Based on this result, the impact in all affected Central and Western Gulf coastal subareas of the proposed action-generated new resident activity is expected to be very low.

High Find Scenario Impacts: This scenario is expected to generate a greater level of employment in the Central and Western Gulf coastal regions than the Most Likely Find Scenario. The new resident activity will also be higher. It is expected that H Scenario exploration forecasts will lead to new resident activity in 1987 only, as was the case in both the Low Find Scenario and the Most Likely Find Scenario, and that the levels of new resident employment, payroll, and population related to proposed action will be 2,552 jobs, $62.5 million, and 5,869 people, respectively. The breakdown of these new resident projections by coastal subarea is shown in Table IV-61. Based on these levels of new resident activity, the impact in all affected coastal subareas under the H Scenario for the proposed action is expected to be very low since such new resident employment, payroll, and population represents less than 1% of the total employment, payroll, and population.

Total Find Scenario Impacts: All future lease sales in the WPA after 1985 are analyzed based on existing undiscovered resources estimates. This scenario is expected to generate significantly greater levels of total and new resident employment than under the L, M, or H Scenarios. Table IV-61 shows new resident employment, payroll, and population expected under the T Scenario. New residents are expected to move into affected coastal regions throughout the 1987 to 1995 period in response to oil and gas activity requirements of future WPA OCS lease sales. Virtually all of these new residents are expected to move into affected Texas coastal counties. The affected Louisiana coastal parishes will experience new resident growth in response to future WPA lease sales in 1987 only. The peak year new resident employment, payroll, and population is expected to occur in 1991 in Texas coastal subareas W-1 and W-2, and 1987 in Louisiana coastal subarea C-1. As shown in Table IV-61, however, the peak year levels represent less than 1% of total employment, payroll, and population expected in that peak year in each coastal subarea. Based on this result, the impact in all affected coastal subareas is expected to be very low.

(p) Impacts on Community Infrastructure

Low Find Scenario Impacts: The estimated new resident employment for this scenario is equivalent to the estimates for the Most Likely Find Scenario. The distribution of population is assumed to be comparable to the distribution indicated for the proposed action in Table IV-62. This low population growth will result in negligible effects on community infrastructure as a result of this scenario.

The impact of the proposed action on community infrastructure in the Gulf region will be very low.

High Find Scenario Impacts: An OCS-generated population growth of 5,900 persons is estimated for this scenario. The peak impact would occur in 1987, with a distribution by coastal subarea as shown in Table IV-62. Coastal subarea W-1 is estimated to have an OCS-generated population growth of 1,000 persons; W-2 is estimated to have 4,300 persons; and C-1 is estimated to have 600 persons. For all subareas, the average annual growth rate is less than 0.05%. Therefore, a very low level of impact is expected on community infrastructure.

Total Find Scenario Impacts: Table IV-62 indicates the estimated OCS-generated population growth resulting under this scenario, which postulates the continuation of OCS lease sales and related exploration, development, and production until all economically recoverable resources are exhausted. Total OCS-generated growth is estimated at 8,800 persons. This total growth is almost 10 times that of the proposed action, but it occurs later (1991) in the Western coastal area. Over 90% of the OCS-generated growth is estimated to occur in counties that have had considerable experience in dealing with the potential adverse effects of such growth. As distributed throughout the coastal subareas and potentially affected counties, the estimated annual growth rates are very low (less than 0.05%), indicating a very low to low level of expected impacts on community infrastructure from future OCS sales. The level of impacts in the Western coastal area would be very low in 14, low in 2, and high in 1 of the 17 potentially affected counties. The level of impacts in the Central coastal area (C-1) would be very low to low.

The combined average annual population growth rates (OCS-generated plus baseline) range from less than 0.05%-5.0% for the potentially affected counties and parishes; 14 of the 22 counties or parishes have growth rates of 1.9% or less. The OCS-generated share of the combined rate is negligible for all the counties.

(q) Impacts on State and Local Land Use Management

Low Find Scenario Impacts: Major new facilities include: no service bases; no pipe coating yards; no pipeline landfalls; and no gas processing plants or refineries.

Texas coastal regulations and the applicable provisions of LCRP which could affect the activities/facilities are discussed under the preceding analysis of the proposed action in Section IV.D.2.a.(18). On the basis of this analysis, it is considered possible for the activities/facilities to be designed, located, constructed, and operated so that the expected level of impact on state and local land use management policies would be very low.

High Find Scenario Impacts: Major new facilities include: 0-1 service base; no pipe coating yards; 0-3 pipeline landfalls with 0-60 miles of onshore routing; and 0-1 gas processing plant.

The new service bases are likely to be located at existing port/industrial areas such as Port Isabel, Port Mansfield, Port of Corpus Christi, Ingleside-Aransas Pass-Rockport, Port Aransas-Harbor Island, Port O'Connor, Freeport, Galveston, and Sabine Pass. Suitable sites are currently available in all of these areas. The 0-3 pipeline landfalls with 0-60 miles of onshore routing (which would terminate at either a major transmission line or processing facility) are estimated to along the Western Coastal Area and into the Central Coastal Area. Potential pipeline landfalls could be located in Texas counties and Louisiana parishes which include Cameron, Willacy, Kenedy, Nueces, San Patricio, Aransas, Calhoun, Matagorda, Brazoria, Galveston, and Jefferson Counties in Texas and Cameron and Vermilion Parishes in Louisiana. Some of these potential locations could involve the problem of crossing barrier islands, estuarine areas, and wetlands.

Texas coastal regulations and the applicable provisions of LCRP which could affect the activities/facilities estimated under the H Scenario, including new facilities described above, are discussed under the preceding analysis of the proposed action in Section IV.D.2.a.(18).

Analysis of the compatibility between the activities/facilities and Texas and Louisiana coastal programs and local land use plans indicates that potential incompatibilities or conflicts can be avoided or effectively mitigated. All post-sale proposals by operators to use specific sites for a particular activity/facility must go through necessary Federal, State, and local review and permitting procedures. This administrative framework has been sufficiently flexible to allow reconciliation of site-specific problems which emerge after the lease sale. Coastal and local land use management programs do not seek to prohibit development in the coastal region (although some sensitive areas may be "off-limits" to certain development); rather, they attempt to guide and control development to ensure that suitable procedures and sites are used and that potential conflicts and adverse impacts are mitigated. On the basis of this analysis, it is considered possible for the activities/facilities to be designed, located, constructed, and operated so that the expected level of impact on state and local land use management policies would be low to very low.

Total Find Scenario Impacts: The major types and numbers of existing and new onshore facilities (including their potential locations) estimated to be used in support of offshore development in the WPA are described in Section IV.A.2.e. The existing support service and processing infrastructure in Texas and Louisiana will be heavily utilized, but may not be sufficient for the peak demand levels; therefore, a considerable number of new facilities may be established.

Major new facilities are in addition to those estimated under the Most Likely Find Scenario include: 4-12 service bases; 0-2 pipe coating yards; 4-11 pipeline landfalls with 40-220 miles of onshore routing; and 2-5 gas processing plants.

The new service bases and pipe coating yards are likely to be located at existing port/industrial areas such as Port Isabel, Port Mansfield, Port of Corpus Christi, Ingleside-Aransas Pass-Rockport, Port Aransas-Harbor Island, Port O'Connor, Freeport, Galveston, and Sabine Pass. Suitable sites are currently available in all of these areas. Likely potential locations for the 2-5 gas processing plants include uplands sites in Cameron, Willacy, Kenedy, Nueces, San Patricio, Aransas, Calhoun, Matagorda, Brazoria, Galveston, and Jefferson Counties in Texas, and Cameron and Vermilion Parishes in Louisiana. The 4-11 pipeline landfalls with 40-220 miles of onshore routing (which would terminate at either a major transmission line or processing facility) are estimated to be widely distributed along the Western Coastal Area and into the Central Coastal Area. Potential pipeline landfalls could be located in the same Texas counties and Louisiana parishes listed above as potential locations for gas processing plants. Some of these potential locations could involve the problem of crossing barrier islands, estuarine areas, and wetlands.

Texas coastal regulations and the applicable provisions of LCRP which could affect the activities/facilities, including new facilities described above, are discussed under the preceding analysis of the proposed action in Section IV.D.2.a.(18).

Analysis of the compatibility between the activities/facilities estimated under the T Scenario and Texas and Louisiana coastal programs and local land use plans indicates that potential incompatibilities or conflicts can be avoided or effectively mitigated. All post-sale proposals by operators to use specific sites for a particular activity/facility must go through necessary Federal, State, and local review and permitting procedures. This administrative framework has been sufficiently flexible to allow reconciliation of site-specific problems which emerge after the sale. Coastal and local land use management programs do not seek to prohibit development in the coastal region (although some sensitive areas may be "off-limits" to certain development); rather, they attempt to guide and control development to ensure that suitable procedures and sites are used and that potential conflicts and adverse impacts are mitigated. On the basis of this analysis, it is considered possible for the activities/facilities to be designed, located, constructed, and operated so that the expected level of impact on state and local land use management policies would be low.

(r) Impacts on Ports and Marine Transportation

Low Find Scenario Impacts: Vessel traffic is expected to increase over existing traffic levels (1982) by only about 4% in subarea W-1, 1% in W-2, and less than 1% in C-1 (ports and traffic in C-1 will be affected by activities occurring in W-3) in the peak year of activity (1991). This scenario also predicts that there will be an increase in the number of structures in the subareas as follows: 2 in W-1; 3 in W-2; and 1 in W-3. These factors indicate that impacts on ports and marine transportation will be low in subareas W-1 and W-2 and very low in C-2.

High Find Scenario Impacts: Vessel traffic is expected to increase over existing traffic levels (1982) by about 22% in subarea W-1, 7% in W-2, and 5% in C-1 in the peak year of activity (1990). This scenario also predicts that there will be an increase in the number of structures in the subareas as follows: 7 in W-1; 19 in W-2; and 4 in C-1. These factors indicate that impacts on ports and marine transportation will be very high in subarea W-1 and moderate in W-2 and C-1.

Total Find Scenario Impacts: Vessel traffic is expected to increase over existing traffic levels (1982) by about 37% in subarea W-1, 11% in W-2, and 9% in C-1 in the peak year of activity (1993). This scenario also predicts that there will be an increase in the number of structures in the subareas as follows: 92 in W-1; 146 in W-2; and 52 in C-1. These factors indicate that impacts on ports and marine transportation will be very high in subarea W-1, high in W-2, and moderate in C-1.

e. Unavoidable Adverse Impacts of the Proposed Action

Sensitive Coastal Habitats: There is a chance that one or more spills greater than 1,000 bbls could occur and contact land within 10 days over the production life of the proposed action. If an oil spill does contact sensitive coastal habitats, adverse environmental impacts could be high. Oil contamination could kill an undetermined amount of coastal vegetation, shellfish, and finfish and/or their larvae, and coastal birds. The adverse effects of oil on sensitive coastal habitats would be relatively long-term.

Construction of new pipelines/infrastructure is expected. Some unavoidable adverse impacts to sensitive coastal habitats are expected from this phase of oil/gas-related activities.

Sensitive Offshore Habitats: Minor decreases in primary productivity due to the mortality or functional impairment of plankton, benthic organisms (including coral communities), seagrasses, and algae will occur in localized areas of high turbidities generated by drilling fluids disposal and bottom sediments suspended by pipeline laying and burying operations.

Disruption will occur if fresh oil spills reach shallow sensitive biological features. Localized mortalities, selective and functional impairment would probably occur, thereby altering the community structure for an unknown, but brief, period of time. The East and West Flower Garden Banks (in the WPA) may be severely diminished as a viable marine sanctuary if pollution accidents occur.

Water Quality: Normal offshore operations would have unavoidable effects to varying degrees on the quality of the surrounding water if the proposed action is implemented. Drilling, construction, and pipelaying would cause an increase in the turbidity of the affected waters for the duration of the activity periods, and, in the case of pipelines, could disturb settled pollutants. A turbidity plume, several hundred yards in length, could also be created by discharge of drill cuttings and the adherent drilling fluids. This, however, would only affect water in the immediate vicinity of the rigs. The discharge of treated sewage from the rigs and platforms would increase the levels of suspended solids, nutrients, chlorine, and BOD in a small area near the discharge points. Chronic spills from platforms and the discharge of formation waters will result in increases of hydrocarbon levels and possibly trace metal concentrations in the water column. Overall, the effect will be the degradation of water quality around platforms, although the extent of the impact will extend only from a few meters to a few tens of meters from the platform site. Unavoidable impacts to onshore water quality will also occur as a result of runoff from construction sites of new facilities, but these impacts will be localized in the vicinity of these sites, and of limited duration. Some additional impacts will accrue from increased sewage due to population growth in certain communities. Regulatory requirements of State water authorities (under Federal and State regulations and guidelines) and some local jurisdictions would be applicable to most, if not all, of these potential impact situations. Therefore, the opportunity would exist to effectively mitigate potential impacts if the applicable regulatory measures were strictly enforced.

Air Quality: Unavoidable adverse impacts to air quality would occur onshore adjacent to crude oil refineries, gas processing plants and areas of concentrated OCS activities. Unavoidable short-term impacts to air quality would occur near catastrophic events (oil spills, blowouts with fire, blowouts without fire) due to evaporation and combustion. Mitigation of long-term effects will be accomplished through existing regulations. However, short-term effects from nonroutine catastrophic events (accidents) are uncontrollable.

Endangered and Threatened Species: OCS-related oil/gas vessel traffic in the Western Gulf could result in some collision injuries to marine turtles. Oil spills could result in some injury or mortality to marine turtles and brown pelicans.

Marine Mammals: Some injury or mortality to individual marine mammals could result from OCS-related oil spills and/or collision with offshore support vessels.

Coastal and Marine Birds: Some injury or mortality to individual and/or local populations of coastal and marine birds could result from OCS-related oil spills.

Commercial Fishing Industry: Of the various types of fishing gear in use in the OCS areas, trawls have the greatest chance for operational conflicts with oil and gas activities. Losses may, however, be compensated under the Fishermen's Contingency Fund or other legal routes. Trawl nets can be snagged on underwater stubs causing damage or loss of the nets. In addition, it is conceivable that snags could damage underwater production equipment or pipelines causing a spill of oil and gas. Because safety equipment is installed, which shuts in production when a loss of pressure occurs, the likelihood of a major spill resulting thereby is considered very small. Less frequently, large objects which were lost overboard from petroleum industry boats, pipeline lay barges, and platforms are caught by fishing gear resulting in damage to the gear and/or its catch of fish; however, occurrence of this type of incident is low. Also, commercial fishermen would probably not harvest fish in the area of an oil spill, as spilled oil could coat or contaminate commercial fish species rendering them unmarketable. Other unavoidable adverse impacts include loss of fish space caused by installation of unburied pipelines, rigs, platforms, or by other OCS-related structures. There may be some localized competition for shore facilities.

Major Shorefront Recreational Beaches: Even though existing regulations and OCS orders prohibit indiscriminate littering of the marine environment with trash, offshore oil and gas operations involving men, machines, equipment, and supplies is bound to result in some littering of the ocean. Human nature and accidents associated with offshore operations will contribute some floatable debris to the ocean environment which will eventually come ashore on major recreational beaches.

Military Use/Warning Areas: In this planning area the trips of helicopters and service boats, and the location and number of exploration rigs and production structures will produce unavoidable adverse impacts on military use of the warning areas to the extent that military missions could be curtailed or shifted to another location within a warning area. In particular, this is an increasing concern within W-228, where the impacts could significantly influence military training and testing to the extent that they jeopardize the lives of military personnel and/or oil- and gas-related personnel working in the areas.

Continued cooperation between industry, the Navy, and the USAF should prevent the loss of life and equipment to industry helicopters and service vessel traffic crossing an intensively used warning area. Continued flexibility in operations by the Navy and USAF should help to maintain multiple use of the warning areas.

Ports and Marine Transportation: A certain amount of interference between vessel traffic and offshore structures will occur as a result of the proposed action. This could lead to an increase in accidents involving OCS vessels and structures. Most foreign flag vessels and others who may be unaware of the locations of structures in an area will generally use the extensive network of safety fairways, which provide clear passage 2 nmi in width through the developed areas of the Gulf (Section I.B.4.a.). Those more familiar with an area may choose not to use the fairways. Coast Guard regulations regarding structure safety lights and horns, and ship safety regulations are important factors in minimizing conflicts and preventing accidents between structures and vessels on the OCS. However, with vessel operations at night, in rough water, or in fog, the potential for accidents increases.

f. Irreversible and Irretrievable Commitment of Resources

Sensitive Coastal Habitats: An irreversible and irretrievable commitment of biological resources could occur where sensitive coastal habitats are impacted by frequent oil spills and chronic low level contamination with oil. Repeated contact with oil will destroy wetlands vegetation which results in soil erosion and land loss. Animals killed by oil spills constitute a permanent loss of coastal biota.

Construction and emplacement of infrastructures and pipelines in sensitive coastal habitats can result in the permanent loss of coastal wetlands due to mechanical destruction of plants and animals and due to land loss facilitated by saltwater intrusion followed by erosion of marsh soils.

Sensitive Offshore Habitats: An irreversible and irretrievable commitment of biotic resources could occur in areas subjected to intensive development, particularly at the East and West Flower Garden Banks (WPA). Oil spills and chronic low level pollution can injure and kill organisms at virtually all trophic levels. Mortality of individual organisms can be expected to occur, and possibly reduction or even elimination of a few small or isolated populations. The magnitude of these effects is nearly impossible to predict; Section IV.D.2.a.(2) identifies the types of impacts which can occur and the resources which are particularly sensitive to adverse impacts resulting from the proposed action. However, our analysis indicates that any adverse impacts resulting from the proposed action are expected to be short-term and very localized.

Cultural Resources: Although the expected impact to cultural resources as a result of the proposed action is uncertain, any interaction between an impact producing factor (drilling of exploratory, delineation, and development wells, placement of platforms, subsea completions, and pipeline installation) and a significant historic shipwreck or prehistoric site would destroy information contained in the site components and in their spatial distribution. This would be an irretrievable commitment of potentially unique archaeological data.

Local Employment, Income, and Population: The proposed action would result in the production of certain OCS-related goods and services. To the extent that resources would be drawn away from other uses, production of goods and services in other areas of other types would be foregone. Steel products, specialized manpower, and capital constitute required resources which may be scarce; use of these resources for OCS needs means that other opportunities for their use might have to be foregone. While these resources may be reclaimed over time, their use as a result of the proposed action would constitute an irreversible and irretrievable commitment of resources at a given point in time. To the extent that underemployed labor resources are used to fill new job opportunities, this would not constitute a cost to society in the form of foregone labor opportunities.

Oil and Gas Development: Leasing of the proposed blocks and subsequent development and extraction would represent an irreversible and irretrievable commitment of nonrenewable oil and gas resources. The estimated amount of resources expected to be recovered as a result of proposed lease Sale 105 is presented in Table IV-1.

g. Relationship Between the Short-term Use of Man's Environment and the Maintenance and Enhancement of Long-term Productivity

The principal short-term use of the leased areas in the Gulf under the proposals would be for the production of an estimated 0.10 billion bbls of oil and an estimated 1.34 tcf of natural gas.

This activity would temporarily interfere with tourism in the region in the event of a major oil spill (1,000 bbls or more) contacting popular tourist beaches. The probability of such an occurrence within a 10-day period after a spill is 5%.

The short-term recovery of hydrocarbons may have long-term impacts on offshore biologically sensitive areas (Sections IV.D.1.a.(2) and IV.D.2.a.(2)) or cultural resources (Sections IV.D.1.a.(11) and IV.D.2.a.(11)).

The proposed leasing may also result in onshore development and population increases which may cause very short-term adverse impacts to local community infrastructure, particularly in areas of low population and minimal existing industrial infrastructure. However, these impacts will occur only in the very short term. A return to equilibrium can be quickly expected as population changes and industrial development are absorbed in expanded communities.

After the completion of oil and gas production, oil spills and their impacts will not occur, and the marine environment is generally expected to remain at or return to its normal long-term productivity levels. It has been recognized that continuous, low-level pollution from toxic chemicals, including oil, may adversely affect long-term ocean productivity. However, to date there has been no discernible decrease in long-term marine productivity in OCS areas where oil and gas have been produced for many years. Areas such as the Atlantic coast, which experienced repeated incidents of oil pollution as a result of tanker groundings during World War II, show no apparent long-term productivity losses, although baseline data do not exist to verify this. In other areas which have experienced apparent increases in oil pollution, such as the North Sea, some long-term effects appear to have taken place. Populations of pelagic birds have decreased markedly in the North Sea in recent years--prior to the beginning of North Sea oil production. Until more reliable data become available, the long-term effects of the chronic and major spillage of hydrocarbons and other drilling related discharges cannot be accurately projected. In the absence of such data, it must be concluded that the possibility of decreased long-term productivity exists as a result of the proposed action. It is possible that such high value areas as the Flower Garden Banks will suffer long-term losses as a result of this proposed action.

OCS development off Louisiana and Texas has supported recreational and commercial fishing activities. This has stimulated the manufacture and sale of larger private fishing vessels and special fishing and recreational equipment. Additionally, commercial enterprises such as charter boats have become heavily dependent on offshore structures for satisfying recreational customers. This proposed action will increase these incidental benefits of offshore development. The platforms expected to result from the proposed action will help replace those currently being removed where production has terminated. As the incidence of offshore fishing and diving has gradually increased in the past three decades, platforms (the focus of much of that activity) will eventually begin to gradually decline as mineral resources become depleted. In order to maintain

the long-term productivity of site-specific, artificial locations attractive to fishermen and divers, some means, such as proliferation of artificial reef development programs, will need to eventually replace platform removals.

In summary, short-term environmental socioeconomic impacts would result from the proposed action, including possible short-term losses in productivity as a result of oil spills. Long-term adverse environmental impacts are not expected with the biological and cultural resources stipulations committed as part of the proposed action, but some risk remains due to the potential for accidents. Oil and gas reserves would be lowered. Few long-term productivity or environmental gains are expected as a result of these proposals; the benefits of the proposed action are expected to be principally those associated with a medium-term increase in supplies of domestic oil and gas. While no reliable data exist to indicate long-term productivity losses as a result of OCS development, such losses are possible. However, to the extent that OCS development would replace imports of oil which would otherwise be required, such losses as a result of tanker-related oil spills may occur in the absence of this proposed action.

SECTION V

CONSULTATION AND COORDINATION

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V. CONSULTATION AND COORDINATION

A. DEVELOPMENT OF THE PROPOSALS

The July 1982 5-Year Oil and Gas Leasing Schedule (Figure I-2 of the Final Regional EIS) authorized two Gulf of Mexico lease sales in 1986: Central Gulf Sale 104 (April) and Western Gulf Sale 105 (July). The Area Identification process for these sales was initiated on June 15, 1984, with the Federal Register publication of the Call for Information (Call) and Notice of Intent to Prepare an EIS (NOI). Copies of the Call/NOI were mailed to the Governors of the affected States, State and Federal agencies, industry, environmental groups, and interested individuals.

The Call identified the CPA and WPA (approximately 80 million acres) as having the potential for the discovery of hydrocarbons. Respondents were asked to delineate areas of potential interest within the Call area and to rank those areas according to priority of interest. The NOI requested information on the scope of the EIS, significant issues which could be addressed, and alternatives which should be considered.

Based on responses to the Call (summarized in Appendix B), DOI identified the area to be analyzed in the Draft EIS for proposed Sales 104 and 105. This action constituted the official Area Identification which was administratively approved on September 24, 1984. The area to be studied included approximately 33.1 million unleased acres in the Central Gulf and approximately 28.2 million unleased acres in the Western Gulf for a total of approximately 61.3 million acres. Two environmentally sensitive blocks (Blocks A-375 and A-389 in High Island Area, East Addition, South Extension) which contain the living coral reefs of the East and West Flower Garden Banks and 123 blocks (located in South Padre Island Area and South Padre Island Area, East Extension) along the United States maritime boundary with Mexico were deferred from Sale 105 in the Western Gulf. No deferrals were proposed for Sale 104 in the Central Gulf.

B. DEVELOPMENT OF THE DRAFT EIS

In order to fulfill the OCSLA (as amended) requirements and CEQ regulations, MMS followed scoping procedures for contacting and coordinating with Federal, State, and local governments; institutions; public interest groups; and concerned individuals throughout the development of this document. There were four major steps in this process:

(1) The Call/NOI publication and mailout which provided information for the Area Identification as discussed above.

(2) Requests for resource information were mailed to the states and appropriate Federal agencies on August 30, 1984. This involved requests for specific technical information and for updated information from agencies which had jurisdiction or special expertise with respect to possible environmental impacts resulting from the lease sales or with authorization to develop and enforce environmental standards to mitigate such impacts.

(3) Following the Area Identification (AI) decision on September 26, 1984, additional scoping letters were sent to the Governors announcing the results of the Area Identification. These further solicited comments and recommendations on potential mitigating measures, alternatives to the proposed actions, significant issues for analysis in the EIS, and potential development scenarios. Similar announcements/requests were also sent to interested State and Federal agencies, industry environmental groups, and individuals.

(4) Meetings: RTWG meetings were held on June 14, 1984, in Tampa, Florida, and on November 29, 1984, in New Orleans, Louisiana. Scoping efforts concerning the proposed 1986 sales were conducted at each of these meetings. A meeting with other

DOI agency representatives was held under the authority of DM 655 on September 18, 1984, in Metairie, Louisiana, to discuss mitigating measures.

In addition to information gathered from the major steps in the process, comments on Draft EIS 94/98/102, which were pertinent to this Draft EIS, and those that were received too late for inclusion in Final EIS 94/98/102 were also used as scoping information for this Draft EIS.

MMS maintains an ongoing scoping process through the consultation and coordination activities of individual staff members with counterparts in State and Federal agencies. Two of the most important of these efforts for this Draft EIS involved the scoping of the wetlands loss and air quality problems. These efforts, preceded by those mentioned above, are summarized below:

An analysis of the impact topics and alternatives considered during the scoping process is provided in Section I.B.2.

CALL FOR INFORMATION/NOTICE OF INTENT

A total of 12 responses to the Call were received: two from states, eight from industry (five companies commented), and one from an environmental group. Below is a summary of pertinent comments:

State of Alabama: Governor George C. Wallace responded to the Call with a letter dated July 26, 1984. Governor Wallace had no comment regarding the (Western) OCS Lease Sale 105. He further stated he had no comment regarding the size, timing, or location of OCS Lease Sale 104 in the Central Gulf of Mexico.

State of Louisiana: The State responded to the Call and NOI with two letters to the Secretary. The first, from Governor Edwards, pertained to issues related to Section 8(g) and the leasing program. It requested that an explanation be provided for Mr. Rankin's authority to speak on Secretary Clark's behalf on previous correspondence pertaining to Section 8(g) since the Secretary of the Interior by title has, according to the Governor, been directed by Congress to perform that function. It stated that no Call for Nominations had been issued for Sales 104 and 105 which is called for by the 1978 OCS Lands Act Amendments. It stated that MMS had once again failed to provide any geological or geophysical information which would permit the State of Louisiana to evaluate tracts situated within the 8(g) areas and that MMS had once more made a unilateral determination of the tracts containing common pools or structures. The State still views the concept of areawide leasing to be illegal and not in the best interest of the Nation or Louisiana.

In the second letter, Secretary William C. Huls of the Department of Natural Resources (DNR), listed a number of issues and concerns dealing with the areawide sale approach, socioeconomic effects, environmental effects, use conflicts, and alternatives to the proposed action.

The State would like to see a cap of 550,000 acres per lease sale adopted in place of the current areawide leasing activity. The purpose of this proposal is to reduce the pace of development and extend the life of the hydrocarbon reserves in the Gulf of Mexico. It is the State's contention that the current leasing practice will cause a short-term acceleration of socioeconomic activity (putting a strain on community facilities) followed by a long-term acceleration resulting in loss of employment and a general decline in the economy of South Louisiana. The State would like to see the acreage cap become an alternative to the proposed action.

According to the states, leasing and the industry activity contributes to environmental effects, including wetlands loss, land loss to infrastructure development, pipeline construction, canal dredging, coastal erosion, and saltwater intrusion. The State fears widespread destruction of coastal environments due to areawide leasing. The concern is that increased development will "push ecosystem tolerances beyond their assimilative capacity." A reduction in lease offerings is urged by the State.

Industry: Of the five companies that responded to the Call with comments, three commented on the lease term. Two companies indicated that 10-year lease terms should begin in water depths greater than 300 meters. One company indicated 400 meters should be the criterion. The need for the longer lease terms in these water depths are due to the long lead time required to effectively perform wildcat and appraisal drilling; platform design, construction, and emplacement; development drilling; and flowline construction.

One company recommended that in water depths greater than 200 meters tract size should be greater than 5,760 acres. This would improve the chances of encompassing potential prospects or fields in their entirety. This would allow more effective and economical development by lessening the number of wells, platforms, flowlines, and facilities necessary to completely develop a field.

Three companies recommended continuation of the areawide sale concept. Specific advantages are that it allows a company to immediately adjust to priority changes caused by new data or technological advances. Companies are free to focus on prospects based solely on industry interest.

Environmental Group: The Sierra Club, Houston Regional Group, in their letter of July 30, 1984, expressed general concern over the need to protect biologically sensitive areas by not leasing those areas. More specific locations were listed for the East Flower Garden Bank (20 blocks) and the West Flower Garden Bank (32 blocks) with blocks A-375 and A-398 being singled out as the most sensitive. This group also called for updated and expanded discussions in the Environmental Impact Statement on three topics: (1) toxic effects of drilling fluids; (2) operational aspects of the oil spill model; and (3) consultation and interagency coordination aimed at protecting sensitive areas.

Follow-Up Contact: Additional contact was made with the affected States because of the poor response to the Call and NOI, and to comply with the Secretary's desire to resolve conflicts at the AI stage in the leasing process.

Telephone calls were made to State RTWG members or designees requesting informally any input on areas of concern/multiple use conflict. The following comments were received:

> Alabama had no comments on the timing, size, and location of the sales. The State encouraged more technical studies off Mobile Bay, particularly physical oceanography and water current studies.
>
> Louisiana had no comments other than those in the State's response to the Call, which were mailed directly to Secretary Clark.
>
> Texas said the State's comments in the past have been on economic, social, and technical issues and not on size, timing, or location of sales.
>
> Mississippi stated two items of concern: the situation regarding the enclaves, which it feels should not be offered until a final court ruling is made, and the boundary line dispute seaward of the barrier islands which is also part of court action.

RESOURCE REPORTS

Requests for Resource Reports for the Draft EIS for proposed Sales 104 and 105 were sent to Federal, State, and local government agencies on August 30, 1984. In most cases, specific technical information was requested. Following is a summary of the responses received.

Federal Agencies

Mobile District Corps of Engineers (COE): The COE provided computer printouts of pipeline permits for dredge and fill activities for which their office is responsible. They invited a member of this staff to visit the Mobile District to review their files and discuss information needs with appropriate members of their staff.

National Oceanic and Atmospheric Administration (NOAA): NOAA provided several papers which describe their programs and types of products that might be useful to this office in writing environmental assessments. A listing of these papers follows:

(1) Strategic Assessment of Multiple-Use Conflicts in the U.S. Exclusive Economic Zone

(2) Gulf of Mexico Strategic Assessment Project

(3) NOAA's Strategic Assessment Program in the Gulf of Mexico

(4) An Automated Data System for Strategic Assessment of Living Marine Resources in the Gulf of Mexico: Preliminary Test Runs for Invertebrates

(5) Analyzing the Potential Effects of Operational Discharges of Oil from Ships in the Gulf of Mexico

(6) Living Marine Resource Analysis Conducted for Lease Sale 76

(7) Summary of Living Marine Resource Analysis for Lease Sale 82

(8) Strategic Assessment Branch Publications

In addition, NOAA offered to provide this office with the kinds of services and technical products described in the above mentioned articles.

Department of Energy (DOE): DOE pointed out that it no longer has a Leasing Policy Development Office. Therefore, their comments are related to overall usage and production of energy resources. They also quoted figures based on a DOE sponsored study of Replacement Costs of Domestic Crude Oil, an as yet unpublished document.

Fish and Wildlife Service (FWS); Ecological Services, Houston, Texas: FWS provided this office with preliminary results of their wetlands project for two Texas bay systems. They indicated that they have commented on approximately 40 COE permit applications in the last two years (FY 83 and 84) and produced an estimate of the amount of acreage of open water, estuarine habitats and palustrine and estuarine wetlands adversely affected by these permit applications.

State of Alabama

Alabama Historical Commission: The Commission had no new archaeological sites to report. In addition, they could offer no new studies in the area for our review.

Geological Survey of Alabama: The Survey cannot provide MMS with some of the requested information as it is not within their jurisdiction to do so. They indicated other State agencies and industry representatives that may provide such information. They provided a copy of Geological Survey of Alabama Map 194, "Generalized Map of Crude Oil, Petroleum Products, and Natural Gas Transmission Lines in Alabama," which is an overview of the oil and gas infrastructure that has been developed in coastal Alabama. They included a copy of Oil and Gas Report 3F, "The

Petroleum Industry in Alabama, 1982" because it can provide necessary information regarding oil, gas, and gas condensate production in Alabama through 1982. They will forward the 1983 report as soon as it becomes available. They have also attached copies of the following two items: Oil and Gas Report 7B, "Oil and Gas Leasing and Drilling in Alabama State Coastal Waters and Adjacent Federal OCS Waters, 1951-1983," and Oil and Gas Map 2, "Oil and Gas Leases and Wells in Alabama State Waters and Adjacent Federal OCS Waters." They will forward the update to Report 7B as it becomes available.

State of Louisiana

Department of Natural Resources (DNR): The DNR could not answer any of the questions directed to them as they are not the responsible agency. They did, however, give a list of sources of contact and their addresses for the various questions and topics.

Department of Culture, Recreation, and Tourism; Office of Cultural Development: This office enclosed a listing of archaeological sites in Louisiana which are on the National Register of Historic Places. They also sent their latest update on this topic.

State of Mississippi

Mississippi Department of Wildlife Conservation: The Department recommended that this office contact specific coastal planning agencies and business research institutions for information on employment, income, and capital investments. They gave an address and contact for information within Mississippi inshore areas. They provided information on man-induced and natural changes in marshlands within the State's coastal area and sent copies of the following reports:

(1) "The Ecology of a Mississippi Tidal Marsh: Part 1 A," by Courtney T. Hackney and Armando A. De La Cruz;

(2) Final Report, "The Ecology of a Mississippi Tidal Marsh," by Armando A. De La Cruz;

(3) "The Seasonal Abundance of Molluscan Fauna of a *Juncus Roemerianus* and a *Spartina Cynosuroides* Brackish Tidal Marsh in Mississippi with Notes on the Resistance of *Neritina Usnea* to Fire, Predation, and Crowding," by Courtney T. Hackney and T. Dale Bishop;

(4) "Vanishing Gulf Coast Wetlands," a pamphlet prepared by the USDOI, Fish and Wildlife Service.

State of Texas

Texas Historical Commission: The Commission sent a combined listing of archaeological sites on the National Register of Historic Places and on the list of State Archaeological Landmarks. They also added that material dredged from Galveston Bay and deposited on the Texas City Dike has yielded an abundance of Pleistocene faunal material. For more information on this topic, they directed this office to a specific contact.

Bureau of Economic Geology: The Bureau responded that although they do not have the data requested, and doubt that it has been collected and analyzed by anyone yet, MMS should contact various State agencies recommended by the Bureau and ask them to open their files so that our staff could utilize their data.

POST AREA IDENTIFICATION SCOPING

On October 24, 1984, the Gulf of Mexico Region mailed out letters to the five Gulf of Mexico States announcing the AI decision and requesting scoping information on potential mitigating measures and alternatives to the proposed action, significant issues, and development scenarios.

Shortly thereafter, approximately 995 similar requests were sent to appropriate Federal and State agencies, industry, environmental groups, and interested individuals. We received six responses: three from states; one from industry; one from a Federal agency; and one from an environmental group.

Below is a summary of pertinent comments:

Federal Agencies

Fish and Wildlife Service: FWS expressed its concern over the possible extensive use of diesel based drilling muds and offered to assist MMS inspection crews in taking samples to determine the extent of the problem. They suggested that it may be appropriate to discuss the inspection procedure in the EIS.

States

State of Alabama: Governor George C. Wallace responded with the following comments:

(1) Mobile Area Blocks 686, 687, 730, 731, 732, 818, 819, and 820 should not be offered for lease in OCS Lease Sale 104. These blocks are involved in a legal dispute between the State of Alabama and the Federal Government.

(2) MMS should require as a lease stipulation that no wells be drilled less than 1,320 feet from the Alabama State line on any Federal tract in Alabama's 8(g) area unless a fair and equitable unitization agreement has been reached between MMS and the State of Alabama. This State feels that this stipulation would prevent drainage of common pools and be consistent with Alabama State Oil and Gas Board Rules and Regulations.

(3) MMS should require as a lease stipulation that all wells drilled on Federal tracts in Alabama's 8(g) area be drilled under the same environmental and water-quality regulations as wells drilled on adjacent state tracts. The State feels that this stipulation would insure the protection of the sensitive ecosystems in Alabama state waters.

State of Louisiana: Both Governor Edwin Edwards and William C. Huls, then Secretary of the Louisiana Department of Natural Resources, responded with identical letters containing the following comments:

(1) MMS should develop and analyze an alternative to the proposed action which would limit the acreage leased to the historical average of 550,000 acres. The State feels that this alternative would encourage paced development and contribute to extended life for the OCS resources off Louisiana's coast and would minimize additional impacts on the coastal zone.

(2) Section 8(g) tracts should be withdrawn from lease sales until agreement is reached between the State and Federal Government over fair and equitable sharing of revenues from this area.

(3) The State is particularly concerned with impacts on its sensitive coastal habitats (including wetlands loss), state and local land use management, community infrastructure and local economic conditions. They feel that the above recommended alternative would be most effective in dealing with these concerns and as such should be analyzed in detail by MMS.

State of Texas: Mr. Robert E. McPherson, Deputy Assistant for Programs, Office of the Governor, responded for Governor Mark White with the following comments:

(1) Section 8(g) tracts should not be offered for lease in Sales 104 and 105 until an agreement is reached on a fair and equitable division of revenues from these tracts.

(2) EIS visuals should be more accurate and the display of data improved.

(3) The MMS studies program should have a higher funding priority within the DOI to ensure that environmental impacts of leasing are appropriately studied.

(4) The areawide leasing program is generally opposed by the State.

(5) There is a general concern over the possible negative effects from an oil spill on native flora and fauna.

Industry

Exxon Company, USA: Mr. Harry C. Martin, Manager, Exploration Department, Gulf/Atlantic Division, responded with the following comments:

(1) Redundancy of static information in the EIS is wasteful for preparers and reviewers. All material appropriate for tiering should be incorporated by reference.

(2) Analytical efforts should concentrate on probable, significant results and impacts that may occur even after mitigating measures are applied.

(3) The EIS should avoid discussion of trivial impacts and data gaps of irrelevant consequence should not be the foundation of significant decisions. Open-ended inquiries about insignificant and remotely possible impacts were not intended by NEPA.

(4) Discussion of potential impacts should include a clear statement of the probability or improbability of the event.

(5) One purpose of NEPA was to ascertain the environmental results of projects in the face of incomplete, unavailable, or exorbitantly expensive data. Recent guidelines by the Council on Environmental Quality (CEQ) on environmental statements have confused "uncertain effects" with "uncertain events". This confusion could cause the dimensions of worst-case analyses to become limitless. To avoid this problem, Exxon endorses the following suggestion of the Pacific Legal Foundation:

No inclusion of a worst-case analysis unless:

(a) A reasonable possibility of the occurrence of the worst-case event rests upon a firm evidentuary basis and the actual circumstances of the contemplated project;

(b) A data base for evaluating its consequences has been established or is establishable without exorbitant cost (This suggestion is intended to expedite and not delay decisions and actions);

(c) The likelihood of the event is shown to be significantly increased by the net results of the project.

(6) The positive impacts of project alternatives should be given a fair presentation in the EIS.

Environmental Group: Dr. F. Hermann Rudenberg, Coastal Affairs Chairman, Sierra Club, Lone Star Chapter, responded with the following comments:

(1) Deferral of Blocks A-375 and A-398 is laudable, but all other unleased and leasable blocks within the 4 mile zone around the Flower Garden Banks should also be deferred.

(2) The Draft EIS should include more discussion on methods of hydrocarbon operations, drilling muds, drill cutting discharges, the nepheloid layer, hurricane hazards and evacuations, vessel anchoring on high-relief banks, possible drilling within designated ocean disposal sites and incineration sites, and the effect of ocean incineration upon drilling rigs and personnel who are exposed to the emissions from ocean incineration. There should also be a discussion of the removal of drilling apparatus and the creation of artificial reefs or other means of disposal.

COMMENTS ON DRAFT EIS 94, 98, AND 102 PERTINENT TO SCOPING FOR DRAFT EIS 104 and 105

Federal Agencies

U.S. Geological Survey (USGS): USGS stated that the effects of oil contacting beaches and barrier islands should be more thoroughly evaluated.

National Oceanic and Atmospheric Administration (NOAA): NOAA stated its concern that Seebree Bank and the East Breaks are not covered by the biological stipulation in the Western Gulf.

U.S. Environmental Protection Agency (USEPA): USEPA feels there is a need to develop data that would support a range of alternative leasing options to protect environmentally sensitive features. They also commented on the adequacy of several of the impact analyses and the methodology used in these analyses.

State of Mississippi

Office of the Governor: Governor Allain states strong objections to the proposal to lease lands situated entirely within Mississippi territorial waters. He finds this particularly disturbing in light of the current litigation on ownership of these lands and the informal agreement between State and Federal Attorneys that neither would attempt to lease the enclaves pending a settlement.

Mississippi Department of Wildlife Conservation: The Department would like to see future EIS documents more fully address resource uses within the "nearshore OCS zone" contiguous with Mississippi waters, and particularly, an evaluation of the potential for use conflict between commercial fishing and the physical location and spacing of oil and gas structures. They also recommend that discharge of pollutants not be allowed closer than 1,000 feet from the State's territorial waters.

State of Louisiana

Louisiana Department of Natural Resources: The Department expressed their concern over the long-term economic and environmental impacts that Louisiana will suffer from areawide leasing. They feel that past impacts have been underestimated because of incorrect predictions of the size of sales.

State of Texas

Office of the Governor: Governor White expressed his opposition to the Areawide Leasing program because of his belief that it transfers too much land too quickly into private hands.

Texas Department of Water Resources: The Department feels that the conclusion that there will be no significant impacts on water supply and community infrastructure should be reexamined because areawide leasing makes it impossible to predict how much leasing and resulting impacts will occur. Also, they feel that the most pronounced effect of OCS development on the State of Texas is likely to be fiscal deficits of affected communities.

Texas General Land Office: The Office stated their concern for equitable economic returns from lease royalty rates from state leases along the lengthy offshore State-Federal boundary, which, they fear, may be affected by lowered rates of adjacent Federal leases. They also indicate the need for biological stipulations on leases near topographic features in the WPA.

University of Texas Bureau of Economic Geology: This Bureau expressed their concerns that coastal habitats could be affected by oil transported through flood tide inlets in several areas and by pipeline landfalls in other areas.

Texas Department of Health: The Department recommended that any proposed lease should have an approvable oil spill contingency plan prior to being issued a permit.

Industry

Shell Offshore Inc.: The company supports the proposed action, but feels that stipulations applied to leases can adequately protect the environment without the deletion of blocks from the sales. They believe that the military stipulation should be more clearly written.

Environmental Groups

Louisiana Wildlife Federation: The Federation's major concern is with the impacts of Sale 98 on Louisiana's wetlands. They would like to see information pertaining to the number of acres directly eliminated or altered by dredging and spoiling, the acreage that will have gradual changes due to changes in water movement, and figures on the fisheries production and wildlife species which may be affected as a result of leasing from Sale 98. They feel that if existing facilities and waterways are utilized as a result of activities from production and development in connection with Sale 98, the sale will share responsibility for problems caused by those developments.

Sierra Club (Houston Regional Group): The Sierra Club states its support for the deferral of the 2 blocks at the East and West Flower Gardens, and suggest that an additional 9 blocks near the West Flower Gardens and 11 blocks near the East Flower Gardens be deleted from Sale 102. They also support Alternative B-1 as the most viable alternative with little environmental or economic impacts.

Orleans Audubon Society: The Society disagrees with the concept of areawide leasing and believes that a cost benefit analysis should be included in the EIS to justify the Proposed Action. They feel that the analysis of wetlands impacts is inadequate and suggest that mitigation of such impacts should receive greater attention.

Others

American Association of Petroleum Landmen: This Association states their strong support for the areawide leasing program and believes that the deletion of blocks from sales is not necessary, since stipulations can adequately mitigate any significant adverse oil and gas impacts.

Tulane Law School: Mr. Oliver A. Houck, Professor of Law, comments that important points dealing with wetlands loss are all but ignored in the Draft EIS and recommends that alternatives be presented in the EIS for funding and implementation of mitigating options for the known impacts of oil development on coastal Louisiana.

Ms. Claire G. Kountz: Ms. Kountz stated that she supports Alternative B for Sale 98 because it would protect the most environmentally sensitive areas while having a negligible effect on the potential recovery of oil and gas. She also points out that when the Central Planning Area (CPA) is divided into its four subareas and assigned an impact level for sensitive coastal habitats, each individual impact appears low, but when added together for an overall CPA impact level, it appears Louisiana does indeed need to be concerned with the impacts of Sale 98 on the State's wetlands.

COMMENTS ON DRAFT EIS 94, 98, AND 102 RECEIVED TOO LATE FOR INCLUSION IN THE FINAL EIS

Federal Agencies

National Park Service (NPS): NPS expressed concern about the adequacy of the evaluation of impacts on Padre and Gulf Islands National Seashores, Big Cypress National Preserve, Everglades National Park, and Fort Jefferson National Monument. Prior planning for beach cleanup resulting from oil and gas activity is urged and pipeline permitting, should this be requested, is stated to be outside of the authority of the agency.

States

State of Mississippi: The Governor of Mississippi stated his objection to the inclusion of the 26 blocks in the Mississippi Sound in Sale 98. He points out these blocks, referred to as the enclaves, are in litigation before the U.S. Supreme Court.

State of Louisiana: The Assistant Secretary of the State Department of Wildlife and Fisheries suggests that impacts on trawling areas, fishery resources, onshore infrastructures and lands and waters associated with pipeline construction are minimized in the Draft EIS. It is further suggested that wildlife and waterfowl refuge areas in Cameron, Vermilion and Iberia Parishes should have special consideration.

Industry

Exxon Company, USA: The recommendation is made to prepare supplemental environmental statements for individual lease sales, instead of preparing a complete EIS.

Others

Mark T. Seitz: Mr. Seitz expresses three concerns: (1) the wetlands analysis should better aggregate natural and human impacts, (2) OCS involvement in navigational canals should be quantified, and 3) state and local permitting authorities should be discussed at greater length.

WETLANDS LOSS SCOPING

Since May 1984, scoping projects have been conducted to determine the prevailing scientific theories, studies, and information needs regarding wetlands deterioration.

In May-September, 1984, the following contacts were made:

(1) Dr. Eugene Turner, Dr. Walter Sikora, Dr. Irv Mendelsohn, Mr. Eric Swanson, Dr. Robert Costanza, Ms. Jean Sikora, and Mr. Chris Neal. (Louisiana State University Center for Wetland Resources - Topic: "Effects of Backfilling of Dredged Areas").

(2) Dr. Sherwood Gagliano (Coastal Environments, Inc. Topic: "Mitigation Measures for Wetlands Deterioration").

(3) Dr. Donald Boesch (Director, Louisiana University Marine Consortium and a member of the Scientific Committee of the OCS Advisory Board Topic: "Perspectives on Wetlands Loss").

(4) Dr. J. Dickson Hoese (Department of Biology, University of Southwestern Louisiana Topic: "Biological Aspects of Wetlands Loss").

(5) Dr. James Gosselink (Louisiana State University, Center for Wetland Resources Topic: "Effects of Canalization on Wetlands Deterioration").

(6) Mr. Drukell Trahan (Louisiana Geological Survey Topic: "Effects of Fluid Withdrawal on Surface Subsidence in Coastal Louisiana).

(7) Mr. Steacy Hicks (National Ocean Service, NOAA, Washington, D.C. Topic: "Modern Rate of Rise of Sea Level").

(8) Captain Yeager (National Geodetic Survey, Washington, D.C.).

(9) Mr. Dave Silkosky (National Geodetic Survey, Washington, D.C.).

(10) Dr. Stephen Leatherman and Michael Kearney (Department of Geography, University of Maryland Topic: "Wetlands Loss in the Chesapeake Bay").

(11) Dr. Joseph Bennett (Director of the Antartic Program, National Science Foundation).

(12) Dr. Ed Pendleton (U.S. Fish and Wildlife Service Topic: Wetlands Loss in the Chesapeake Bay").

(13) Dr. Robert Chabreck (School of Forestry, Wildlife and Fisheries, Louisiana State University Topic: "Mapping Wetlands Changes in Coastal Louisiana").

(14) Mr. Dennis Chew (U.S. Army Corps of Engineers, New Orleans Topic: "Freshwater Diversion Projects to Mitigate Wetlands Loss").

(15) Dr. John Wells (Coastal Studies Institute, Louisiana State University Topic: "Geologic Processes Affecting Wetlands Loss on the Mississippi River Delta").

(16) Mr. Robert Baumann (Center for Energy Studies, Louisiana State University Topic: "Sedimentation Rates in Louisiana Coastal Marshes").

Scoping efforts on this issue have also included sending Requests for Resource Reports to the States of Texas, Mississippi, Alabama, and Louisiana. The purpose was to obtain information on pipeline installations and the role of the other factors involved in wetlands deterioration in each of these states.

Efforts were also made to utilize information from the Corps of Engineers, Parish Police Juries, Louisiana Department of Wildlife and Fisheries, and the Louisiana Department of Natural Resources, Coastal Management Section, to determine the extent of onshore oil and gas activities and associated canalization.

Other projects to enhance our information on this subject included sessions on wetlands loss at the Information Transfer Meeting in November 1984. Presentations and discussions of contributing factors and potential mitigating measures were made.

We have concluded that information is insufficient at this time to unequivocally rate the relative importance of the different factors involved in wetlands loss.

To provide more conclusive answers to questions concerning the relative importance of the various factors involved and the role of the Federal OCS oil and gas program in wetlands loss, the following additional information is needed:

(1) quantification of State onshore oil and gas impacts;

(2) quantification of OCS oil and gas impacts, including the acreage of habitat changes (estuarine open water, estuarine emergent wetland, and upland) resulting form OCS induced activities;

(3) determination of the equilibrium size of the Mississippi Delta under present conditions;

(4) quantification of the relationship between submergence and land loss rates; and

(5) influence of canal orientation, size, and density on marsh loss.

Based on the results of our scoping, a relevant study (No. G538, "OCS Development and Potential Coastal Habitat Alteration") is scheduled for implementation in 1985. The objective of this study is to identify and quantitatively evaluate the various factors that cause wetlands loss in coastal Louisiana and Texas.

C. DISTRIBUTION OF THE DRAFT EIS FOR REVIEW AND COMMENT

Copies of the Draft EIS will be sent to the agencies/groups listed below for their review and comment.

Federal Agencies

Advisory Council on Historic Preservation
Department of Commerce
    National Oceanic and Atmospheric Administration

        - Office of Ecology and Environmental Conservation
        - Ocean Assessment Division
        - Office of Coastal and Ocean Resource Management
        - Office of Coastal Zone Management
    - National Marine Fisheries Service
    - National Ocean Service
- Department of Defense
    - Installations and Housing
    - Department of the Air Force
    - Department of the Army
        - Corps of Engineers
    - Department of the Navy
- Department of Energy
    - Federal Energy Regulatory Commission
- Department of the Interior
    - Bureau of Mines
    - Fish and Wildlife Service
    - Geological Survey
    - National Park Service
    - Natural Resources Library
- Department of State
- Department of Transportation
    - Coast Guard
    - Materials Transportation Bureau
    - Office of Pipeline Safety Regulations
- Department of the Treasury
- Environmental Protection Agency
- General Accounting Office
- Gulf Regional Fishery Management Council
- Library of Congress - CRS
- Marine Mammal Commission
- Nuclear Regulatory Commission
- Office of the Solicitor
- Select Committee on the Outer Continental Shelf
- Sports Fishing Institute

State and Local Agencies

- Alabama
    - Governor's Office
    - A-95 Clearinghouse
    - Alabama Coastal Area Board
    - Alabama Coastal Zone Recreation and Tourism Specialists
    - Alabama Department of Conservation
    - Alabama Department of Natural Resources
    - Alabama Development Office
    - Alabama Geological Survey
    - Alabama Historical Commission
    - Alabama State Historic Preservation Officer
    - Alabama State Planning Officer
    - Alabama Water Improvement Commission
    - Dauphin Island Marine Laboratory
    - Mobile Office of Intergovernmental Relations

- South Alabama Regional Planning Commission
- State Oil and Gas Board
- Tombigbee Regional Commission

Mississippi
- Governor's Office
- A-95 Clearinghouse
- Bureau of Marine Resources
- Gulf Regional Planning Commission
- Jackson County Planning Commission
- Mississippi Bureau of Outdoor Recreation
- Mississippi Cooperative Extension Service
- Mississippi Department of Archives and History
- Mississippi Department of Planning and Policy
- Mississippi Department of Wildlife
- Mississippi Marine Resources Council Advisory Committee
- Mississippi Natural Heritage Program
- Mississippi Research and Development Center
- Mississippi State Historic Preservation Officer
- Southern Mississippi Regional Planning Commission

Louisiana
- Governor's Office
- A-95 Clearinghouse
- Acadiana Regional Clearinghouse
- Department of Culture, Recreation, and Tourism
- Department of Natural Resources
- Department of Transportation and Development, Coastal Resources Program
- Department of Wildlife and Fisheries
- Evangeline Economic Development District
- Geological Survey
- Imperial Calcasieu Regional Planning Commission
- Louisiana Cooperative Extension Service
- Louisiana Geological Survey
- Louisiana State Historic Preservation Officer
- Metropolitan Regional Clearinghouse
- New Orleans City Planning Commission
- Office of Program Development
- Office of Science, Technology, and Environmental Policy
- Office of State Planning
- Regional Planning Commission for Jefferson, Orleans, St. Bernard, and St. Tammany Parish
- Secretary of State
- South Central Planning and Development Commission
- State Mineral Board
- Teche Regional Clearinghouse

Florida
- Governor's Office
- Apalachee Regional Planning Council
- A-95 Clearinghouse
- Apalachicola Regional Planning Council
- Central Florida Regional Planning Council
- Charlotte County Planning Department
- Executive Office of the Governor

Florida Audubon Society
Florida Bureau of Coastal Zone Planning
Florida Chapter Nature Conservancy
Florida Department of Commerce
Florida Department of Community Affairs
Florida Department of Environmental Regulation
Florida Department of Natural Resources
Florida Department of State
Florida Department of Transportation
Florida Division of Economic Development
Florida Division of Recreation and Parks
Florida Institute of Oceanography
Florida Office of Coastal Management
Florida State Historic Preservation Officer
Gulf Regional Fisheries Council
ManaSota 88
North Central Regional Planning Council
Office of Budget and Planning
South Florida Regional Planning Council
Southwest Florida Regional Planning Council
Tampa Bay Regional Planning Council
West Florida Regional Planning Council
Withlacoochee Regional Planning Council

Texas
Governor's Office
A-95 Clearinghouse
Bureau of Economic Geology
Coastal and Marine Council
Coastal Bend Council of Governments
Corpus Christi Parks Department
Galveston County Parks Department
General Land Office
Golden Crescent Council of Governments
Governor's Budget and Planning Office
Houston-Galveston Area Council
Lower Rio Grande Valley Development Council
Southeast Texas Regional Planning Commission
Texas Air Quality Board
Texas Antiquities Commission
Texas Coastal and Marine Council
Texas Coastal Program
Texas Department of Public Health
Texas Department of Water Resources
Texas Highway Department
Texas Historical Commission
Texas Legislative Committee to Study Texas Beaches
Texas Parks and Wildlife Department

Academic Institutions and Libraries

Arizona State University
Auburn University (Alabama)
Austin Public Library

Battelle-Pacific Northwest Laboratories
Baylor University
Brazoria County Library
Calcasieu Parish Library
Center for Bio-Organic Studies
Charlotte-Glades Regional Library
Dallas Public Library
Harrison County Library
Houston Public Library
Lafayette Public Library
Lamar University
La Ratama Library
Leon County Public Library
Louisiana State Library
Louisiana State University
Louisiana University Marine Consortium
Mississippi State University
Mobile Public Library
Montgomery Public Library
New Orleans Public Library
Northwest Regional Library System
Rosenburg Library
Southern Methodist University
St. Petersburg Public Library
Tampa-Hillsborough County Public Library System
Texas A&M University
Texas Southmost College Library
Tulane University (Louisiana) Law School
University of Miami, Gulf and Caribbean Fisheries Institute
University of New Orleans
University of South Alabama
University of Texas, Marine Science Institute
Virginia Institute of Marine Science
West Florida Regional Library
Woods Hole Oceanographic Institute

Industrial Firms

Amoco Production Company
Brown and Root
Chevron
Clean Gulf Associates
Conoco Inc.
Exxon Co., USA
GECO U.S.
Gulf Oil Exploration and Production Co.
J. Ray McDermott
Marathon Oil Company
Mesa Petroleum Company
Mobil Oil E&P Southeast Inc.
National Ocean Industries Association
Offshore Operators Committee
Pennzoil Company

- Shell Oil Co. (Offshore)
- Snyder Exploration Company
- Tennessee Gas Pipeline Co.
- Texaco
- Zapata Offshore

Groups and Individuals

- Alabama Conservancy
- Alabama Environmental Quality Association
- Alabama Ornithological Society
- Alabama Wildlife Federation
- American Fisheries Society
- American Institute of Nautical Archaeology
- American Petroleum Institute
- American Sportsfishing Federation
- Citizens Environmental Coalition (Texas)
- Coast Alliance (Georgia)
- Coastal Bend Conservation Association
- Defenders of Wildlife
- Ecology Center of Louisiana
- Environmental Confederation of Southwest Florida
- Environmental Information Center (Florida)
- ENVIROSOUTH INC. (Alabama)
- Falkenheiner, Doris
- First Freeport National Bank
- Fishermen's Contingency Fund
- Florida Audubon Society
- Florida Conservation Council
- Florida Defenders of the Environment
- Florida Public Interest Research Group, Inc.
- Florida Wildlife Federation
- Fondren III, Walter
- Gulf Coast Research Lab
- Gulf Islands National Seashore
- Gulf Islands National Wildlife Refuge Complex
- Gulf States Marine Fisheries Commission
- Houston Sportsmen's Club
- International Game Fish Association
- Izaak Walton League (Florida)
- Kountz, Claire G.
- League of Women Voters
- Louisiana Environmental Professionals Association
- Louisiana Fisheries Federation
- Louisiana Historical Center
- Louisiana Nature Center
- Louisiana Wildlife Biologist Association
- LUMCON
- Lyle St. Amant Marine Lab
- Marine Wilderness Society (Louisiana)
- Mississippi Chapter, Sierra Club
- Mississippi Coast Fisheries Association
- Mississippi Natural Heritage Program
- Mississippi Sea Grant Advisory Service

Mississippi Wildlife Federation
National Audubon Society
National Coalition for Marine Conservation (Georgia)
National Oceanic Industries Associations
Natural Resources Defense Council, Inc.
Organization for Artificial Reefs
Orleans Audubon Society
Orr, J. Duane
Petroleum Information Composition
Port of Corpus Christi Authority
San Antonio Conservation Society
Save Our Wetlands
Sierra Club (Florida)
Sierra Club, Gulf Coast Group
Sierra Club (Austin and Houston, Texas)
Southeast Texas Resources
Southern Archaeological Research, Inc.
Southwest Culture Resources Center
Sport Fishing Institute (Washington, D.C.)
Sportsmen's Club of Texas
Texas Bay and Gulf Fishermen Association
Texas Environmental Coalition
Texas Nature Conservancy
Texas Shrimp Association
Thomas, J. E.
Times Picayune - States Item
Welder Wildlife Foundation
Wildlife Society, Mississippi Chapter

SECTION VI

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VI. BIBLIOGRAPHY AND SPECIAL REFERENCES

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SECTION VII

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SECTION VIII

GLOSSARY

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VIII. GLOSSARY

Aliphatic - Of or pertaining to any organic compound of hydrogen and carbon characterized by a straight chain of the carbon atoms; three subgroups of such compounds are alkanes, alkenes, and alkynes.

Analysis Area - An OCS subplanning area or other OCS area (i.e., Eastern subplanning area E-4x) plus the adjacent coastal subarea; e.g., Eastern Analysis Area E-3 is composed of the offshore Eastern subplanning area E-3 plus Eastern coastal subarea E-3.

Anticline - An upfold or arch of stratified rock in which the beds or layers bend downward in opposite directions from the crest or axis of the fold.

API gravity - A special function of relative density which is the inverse of the usual scientific specific gravity term. It actually expresses a function of volume per unit weight with a higher number indicating that the crude oil (or other petroleum material) contains a higher content of gasoline and other light components.

Areas of high marine productivity - Include such areas as open bays, estuaries, and sounds that are used by finfish and shellfish as nursery and/or spawning grounds and may contain oyster reefs; nearshore Gulf areas that are important harvest grounds for menhaden and industrial bottomfish and/or finfish and shellfish spawning grounds; and coral areas in the vicinity of the Florida Keys.

Aromatic - Applied to a class of organic compounds containing benzene rings or benzenoid structures.

Asphaltene - Any of the dark, solid constituents of crude oils which are soluble in carbon disulfide but insoluble in paraffin napthas.

Ballast treatment - Treatment of a tanker's ballast water, which is contaminated by residuals of the original tanker cargo.

Barrel - Equal to 42 gallons.

Basin - A depression of the earth in which sedimentary materials accumulate or have accumulated, usually characterized by continuous deposition over a long period of time; a broad area of earth beneath which the strata dip, usually from the sides toward the center.

Biological opinion - An appraisal from either FWS or NMFS evaluating the impact of a proposed activity on endangered and threatened species.

Block - A geographical area, as portrayed on an official MMS protraction diagram or leasing map, that contains approximately nine square miles (2,304 hectares or 5,760 acres).

Blowout - Refers to an uncontrollable flow of fluids from a wellhead or wellbore. Unless otherwise specified, a flow of fluids from a flowline is not considered a blowout as long as the wellhead control valves can be automatically or manually activated. If the wellhead control valves become inoperative, the flow is classified as a blowout.

Blowout preventer - A stack or an assembly of heavy-duty valves attached to the top of the casing to control well pressure.

Bottomland hardwoods - Plant community typical of seasonally flooded floodplains.

Bunker fuel - Heavy residual fuel oil used in ships' boilers and in large heating and generating plants.

Caprock - A disk-like plate over all or part of the top of most salt domes in the Gulf coast states, composed of anhydrite, gypsum, limestone, and occasionally sulfur. Caprock may also be a comparatively impervious stratum immediately overlying an oil- or gas-bearing rock in an anticline.

Central Analysis Area - The Central Planning Area plus the Central Coastal Area.

Central Coastal Area - The onshore and coastal state water areas of Alabama, Mississippi, and Louisiana.

Central Planning Area - The sale area offshore Alabama, Mississippi, and Louisiana.

Central subplanning area - A discrete subarea within the larger offshore planning area.

Cetacean - A marine mammal such as whales, dolphins, porpoises, and related forms.

Coastal subareas - Discrete analysis areas (consisting of several counties/parishes) within the larger offshore coastal areas.

Coastal waters - Those waters surrounding the continent which exert a measurable influence on uses of the land.

Coastal wetlands - Include forested and nonforested habitats, mangroves, and all marsh islands which are exposed to the Gulf of Mexico waters. Acreage and shoreline distances for these categories can be found on Visual No. 14. Included in forested wetlands are hardwood hammocks, cypress-tupelogum swamps, and fluvial vegetation/bottomland hardwoods. Nonforested wetlands include fresh, brackish, and salt marshes. These areas directly contribute to the high biological productivity of coastal water by input of detritus and nutrients, by providing nursery and feeding areas for shellfish and finfish, by serving as habitat for many birds and other animals, and by providing waterfowl hunting and fur trapping.

Coastal zone - The coastal waters (including the lands therein and thereunder) and the adjacent shorelands (including the waters therein and thereunder), strongly influenced by each other and in proximity to the shorelines of the several coastal states, and includes islands, transitional and intertidal areas, salt marshes, wetlands, and beaches. The zone extends seaward to the outer limit of the United States territorial sea. The zone extends inland from the shorelines only the extent necessary to control shorelands, the uses of which have a direct and significant impact on the coastal waters. Excluded from the coastal zone are lands the use of which is by law subject to the discretion of or which is held in trust by the Federal Government, its officers, or agents.

Commingling - Bringing together the production from wells, leases, pools, and fields with production of other operators.

Completion - Conversion of a development well or an exploratory well into a production well of oil and/or gas.

Condensate - Liquid hydrocarbons produced with natural gas that are separated from the gas by cooling and various other means. Condensate generally has an API gravity of 50°-120° and is water-white, straw, or bluish in color.

Conditional resources - Assessment of oil or gas resources under the assumption that economically recoverable resources exist within the area of interest.

Continental margin - A zone separating the emergent continents from the deep sea bottom.

Continental shelf - A broad, gently sloping, shallow feature extending from the shore to the continental slope.

Continental slope - A relatively steep, narrow feature paralleling the continental shelf; the region in which the steepest descent to the ocean bottom occurs.

Contingency plan - A plan for possible offshore emergencies prepared and submitted by the oil or gas operator as part of the Plan of Development and Production.

Deferral - Action taken by the Secretary of the Interior at the time of the Area Identification to remove certain areas/blocks from the proposed sale. Deferred areas could receive environmental description in the EIS but are not assessed as alternatives.

Deletion Alternative - An option available to the Secretary of the Interior to alter the proposed action in Alternative A by deleting areas/blocks from the sale. This action would normally take place after completed analysis is available in the Final EIS.

Delineation well - A well which is drilled for the purpose of delineating a discovered oil or gas reservoir, thereby enabling the lessee to determine whether to proceed with development and production.

Designated environmental preservation areas - Gulf of Mexico shorefront areas which have been established for the quality and significance of their natural environments. They have been legislatively, administratively, or privately protected from the developmental influences of man and are managed solely for the preservation, understanding, and appreciation of their natural attributes. Included are National Parks and Preserves, National and State Wilderness Areas, National Marine and Estuarine Sanctuaries, National Landmarks, Wildlife Sanctuaries, Florida Aquatic Preserves, and Environmentally Endangered Lands.

Detritus - Particulate organic matter originating primarily from the physical breakdown of dead animal and plant tissue (may also include the breakdown of inorganic material).

Detritivores - Animals whose diet consists of detritus and the microbial fauna attached to detrital particles.

Development - Activities that take place following discovery of minerals in paying quantities, including geophysical activity, drilling, platform construction, and operation of all onshore support facilities; and that are for the purpose of ultimately producing the minerals discovered.

Development well - A well drilled to a known producing formation in a previously discovered field. To be distinguished from a wildcat, or exploratory well and from an offset well.

Development/production service base - A service base which is used in support of offshore development and production activity.

Diapir - A piercing fold; an anticlinal fold in which a mobile core, such as salt, has broken through the more brittle overlying rocks.

Dilution - The reduction in the concentration of dissolved or suspended substances by mixing with water.

Discharge - Something that is emitted; flow rate of a fluid at a given instant expressed as volume per unit of time.

Discovery - The initial find of significant quantities of fluid hydrocarbons on a given field on a given lease.

Dispersion - A distribution of finely divided particles in a medium.

Dome - A roughly symmetrical upfold, the beds dipping in all directions, more or less equally, from a point; any structural deformation characterized by local uplift approximately circular in outline, for example, the salt domes of Louisiana and Texas.

Drill ship - A self-propelled, self-contained vessel equipped with a derrick amidship for drilling wells in deepwater.

Drilling mud - A special mixture of clay, water, or refined oil, and chemical additives pumped downhole through the drill pipe and drill bit. The mud cools the rapidly rotating bit; lubricates the drill pipe as it turns in the well bore; carries rock cuttings to the surface; serves to keep the hole from crumbling or collapsing; and provides the weight or hydrostatic head to prevent extraneous fluids from entering the well bore and to control downhole pressures that may be encountered (drilling fluid).

Eastern Analysis Area - The Eastern Planning Area plus the Eastern Coastal Area.

Eastern Coastal Area - The onshore and coastal state water areas of Florida.

Eastern Planning Area - The sale area offshore Florida and offshore Baldwin County, Alabama.

Eastern subplanning area - A discrete subarea within the larger offshore planning area.

Economically recoverable resource estimate - An assessment of hydrocarbon potential that takes into account the physical and technological constraints on production and the influence of costs of exploration and development and market price on industry investment in OCS exploration and production.

Effluent - The liquid waste of sewage and industrial processing.

Endangered and threatened species - Those species identified in 43 FR 238 (December 11, 1978) and subsequent publications.

Environmental impact statement - A statement required by the National Environmental Policy Act of 1969 (NEPA) or similar State law in relation to any major action significantly affecting the environment; a NEPA document.

Estuary - Semienclosed coastal body of water which has a free connection with the open sea and within which seawater is measurably diluted with fresh water.

Eutrophic(ation) - A body of water rich in dissolved nutrients (as phosphates) but often shallow and seasonally deficient in oxygen.

Expected impact - Those alterations or changes to environmental conditions estimated to be probable or likely to occur as a result of a proposed action.

Exploration - The process of searching for minerals. Exploration activities include: (1) geophysical surveys where magnetic, gravity, seismic, or other systems are used to detect or infer the presence of such minerals and (2) any drilling, except development drilling, whether on or off known geological structures. Exploration also includes the drilling of a well in which a discovery of oil or natural gas in paying quantities is made and the drilling, after such a discovery, of any additional well that is needed to delineate a reservoir and to enable the lessee to determine whether to proceed with development and production.

Exploratory well - A well drilled in unproved or semi-proven territory for the purpose of ascertaining the presence underground of a commercial petroleum or natural gas deposit.

Exposed coastline - Shoreline areas that can be directly impacted by activities in OCS waters (Visual No. 14). All of the shoreline not classified as unexposed is exposed.

Fault - A fracture in the earth's crust accompanied by a displacement of one side of the fracture with respect to the other.

Field - An area within which hydrocarbons have been concentrated and trapped in economically producible quantities in one or more structural or stratigraphically related reservoirs.

Florida hammocks - Areas of higher elevation than their surroundings and characterized by hardwood and/or palm vegetation.

Flowlines - Pipelines that move oil from a header system, tank platform, or other facility to a point of final metering, processing, and/or sale.

Gathering lines - Pipelines used to bring oil from production leases by separate lines to a central point, that is, a tank farm or a trunk pipeline.

Geochemical - Of or relating to the science dealing with the chemical composition of and the actual or possible chemical changes in the crust of the earth.

Geologic hazard - A feature or condition that, if unmitigated, may seriously jeopardize offshore oil and gas exploration and development activities. Mitigation may necessitate special engineering procedures or relocation of a well.

Geomorphology - The science of surface landforms and their interpretation on the basis of geology and climate.

Geophysical - Of or relating to the physics of the earth, especially the measurement and interpretation of geophysical properties of the rocks in an area.

Geophysical survey - The exploration of an area during which geophysical properties and relationships unique to the area are measured by one or more geophysical methods.

Habitat - A specific type of place that is occupied by an organism, a population, or a community.

Herbivores - Animals whose diet consists of plant material.

High density offshore shellfish areas - Include nearshore areas known to have the highest concentrations of commercially important shrimp, spiny lobster, and stone crab.

Hydrocarbon - Any of a large class of organic compounds containing primarily carbon and hydrogen, comprising paraffins, olefins, members of the acetylene series, alicyclic hydrocarbons, and aromatic hydrocarbons, and occurring in many cases in petroleum, natural gas, coal, and bitumens.

Impact - A measurable alteration or change in environmental conditions.

Industry infrastructure - The facilities associated with oil and gas development, e.g., refineries, gas processing plants, etc.

Jack-up rig - A barge-like, floating platform with legs at each corner than can be lowered to the sea bottom to raise the platform above the water.

Land segment - A subarea, usually consisting of one or more counties or parishes, within the coastal subarea (see Visual No. 12).

Landfall - The site at which a marine pipeline comes to shore.

Land use - The function for which people employ an area of land.

Lay barge - A shallow-draft, barge-like vessel used in the construction and laying of underwater pipelines.

Lease - Any form of authorization which is issued under Section 8 or maintained under Section 6 of the Outer Continental Shelf Lands Act and which authorizes exploration for, and development and production of, minerals.

Lease sale - The competitive auction of leases granting companies or individuals the right to explore for and develop certain minerals within a defined period of time.

Lease term - For oil and gas leases, a period of either five years or up to ten years (when a longer period is necessary to encourage exploration and development in areas because of unusually deep water or other adverse conditions (see primary term)).

Lighter - A barge or small tanker used to move cargo from a large ship to port; also, to transport by lighter.

Major shorefront recreational beaches - Those frequently visited sandy areas along the shorefront exposed to the Gulf of Mexico which support a multiplicity of recreational activity, most of which is focused at the land-water interface. Included are National Seashores and other selected areas in the National Parks System, State Park and Recreational Areas, county and local parks, urban beachfronts, and private resort areas.

Major accidents - Includes spills of 10,000 gallons (238 bbls) or more and includes those blowouts, explosions, and fires which result in major structural damage or loss of life.

Marshes - Persistent emergent nonforested wetlands characterized by vegetation consisting predominantly of cordgrasses, rushes, and cattails.

Military warning area - An area established within which the public is warned that military activities take place.

Offloading - Another name for unloading; offloading refers more specifically to liquid cargo, crude oil, and refined products.

Offshore marine recreational fishing - Hook and line sport fishing from a boat seaward of the beach in the Gulf of Mexico for fun, food and occasional incidental profit, inclusive of spearfishing.

Offshore monobuoy - A buoy system at which a tanker may anchor, discharge, or load petroleum products.

Oil spill - A sudden, unintentional, or accidental unplanned release of oil.

Operational discharge - A release of oil that is part of the routine operations of a function.

Organic matter - Material derived from living plant or animal organisms.

Outer Continental Shelf (OCS) - All submerged lands that comprise the continental margin adjacent to the United States and seaward of state offshore lands.

Penaeids - Chiefly warm water and tropical prawns belonging to the family Penaeidae.

Petroleum - An oily, flammable bituminous liquid that occurs in many places in the upper strata of the earth, either in seepages or in reservoirs; essentially a complex mixture of hydrocarbons of different types with small amounts of other substances; any of various substances (as natural gas or shale oil) similar in composition to petroleum.

Plan of Development and Production - A plan describing the specific work to be performed, including all development and production activities that the lessee(s) propose(s) to undertake during the time period covered by the plan and all actions to be undertaken up to and including the commencement of sustained production. The plan also includes descriptions of facilities and operations to be used, well locations, current geological and geophysical information, environmental safeguards, safety standards and features, time schedules, and other relevant information. Under 30 CFR 250.34-2, all lease operators are required to formulate and obtain approval of such plans by the Director of the Minerals Management Service before development and production activities commence.

Plan of Exploration - A plan based on available relevant information about a leased area that identified, to the maximum extent possible, the potential hydrocarbon accumulations and wells that the lessee(s) propose(s) to drill to evaluate the accumulations within the entire area of the lease(s) covered by the plan. Under 30 CFR 250.34-1, lease operators are required to formulate and obtain approval of such plans by the Director of Minerals Management Service before significant exploration activities may commence.

Plankton - Passively floating or weakly motile aquatic plants and animals.

Platform - A steel or concrete structure from which offshore development wells are drilled.

Porous - Containing void spaces that may be occupied by fluids.

Potable - Suitable for drinking.

Potential impact - The range of alterations or changes to environmental conditions that could be caused by a proposed action.

Primary production - Production of carbon by a plant through photosynthesis over a given period of time.

Primary term - The initial period of oil and gas leases, normally five years (see lease term).

Production - Activities that take place after the successful completion of any means for the removal of minerals, including such removal, field operations, transfer of minerals to shore, operation monitoring, maintenance, and workover drilling.

Production curve - A curve plotted to show the relation between quantities produced during definite consecutive time intervals.

Production schedule - A percentage distribution intended to show quantities of oil or gas produced over a consecutive time interval.

Production well - A well which is drilled for the purpose of producing oil or gas reserves. It is sometimes termed development well.

Province - An area throughout which geological conditions have been similar or that is characterized by particular structural, petrographic, or physiographic features.

Recoverable resource estimate - An assessment of oil and gas resources that takes into account the fact that physical and technological constraints dictate that only a portion of resources or reserves can be brought to the surface.

Refining - Fractional distillation, usually followed by other processing (for example, cracking).

Relief - The elevations or inequalities of a land surface.

Reserve estimate - An assessment of the portion of the identified oil or gas resource that can be economically extracted.

Reserves - Portion of the identified oil or gas resource that can be economically extracted.

Reservoir - An accumulation of hydrocarbons that is separated from any other such accumulation.

Rig - A structure used for drilling an oil or gas well.

Right-of-way - A legal right of passage, an easement; the specific area or route for which permission has been granted to place a pipeline, ancillary facilities, and for normal maintenance thereafter.

Risked, economically recoverable resource estimate - An assessment of oil or gas resources that has been modified to take into account: (1) physical and technological constraints on production; (2) the influence of the costs of exploration and development and market price on industry investment in OCS exploration and production; (3) and the uncertainty of the estimate and to account for the possibility that economically recoverable resources may not be found within the area of interest.

Saltwater intrusion - Phenomenon occurring when a body of salt water, because of its greater density, invades a body of fresh water. Occurs in either surface or groundwater sources.

Sciaenids - Fishes belonging to the croaker family (Sciaenidae).

Seagrass beds - More or less continuous mats of submerged rooted marine flowering vascular plants occurring in shallow tropical and temperate waters. Seagrass beds provide habitat, including breeding and feeding grounds, for adults and/or juveniles of many of the economically important shellfish and finfish. As such, this habitat type is especially sensitive to oil spill impacts.

Sediment - Material deposited (as by water, wind, or glacier) or a mass of deposited material.

Sedimentary rocks - Rock formed of mechanical, chemical, or organic sediment.

Seismic - Pertaining to, characteristic of, or produced by earthquakes or earth vibration; having to do with elastic waves in the earth.

Sensitive coastal habitats - Coastal habitats susceptible to damage from oil/gas-related OCS activities.

Sensitive offshore area - An area containing species, populations, communities, or assemblages of living resources, to which normal oil and gas exploration and development activities may cause irreparable damage, including interference with established ecological relationships.

Shunting - A method used in offshore oil and gas drilling activities where expended drilling cuttings and fluids are discharged near the ocean seafloor rather than at the surface, as is the case in normal offshore drilling operations.

Single point mooring (SPM) - Offshore anchoring and loading or unloading point connected to shore by an undersea pipeline. Used in areas where existing harbors are not deep enough for laden tankers.

Stratigraphic trap - A geologic feature that includes a reservoir, capable of holding oil or gas, that is formed from a change in the character or extent of the reservoir rock. Such a trap is harder because it is not dependent on structural closure and is thus not readily revealed by geological or geophysical surveys.

Subsea completion - A self-contained unit to carry men from a tender to the ocean bottom and enable them to install, repair, or adjust wellhead connections in a dry, normal atmosphere.

Subsea complex - A development well in which the assembly of valves, pipes, and fittings used to control the flow of oil or gas is located on or near the ocean floor.

Subsidence - A sinking of a part of the earth's crust.

Summary report - A document prepared by the Department of the Interior pursuant to 30 CFR 252.4 that is intended to inform affected state and local governments as to current OCS reserve estimates, projections of magnitude and timing of development, transportation planning, and general location and nature of nearshore and onshore facilities.

Supply boat - A vessel that ferries food, water, fuel, and drilling supplies and equipment to a rig and returns to land with refuse that cannot be disposed of at sea.

Sweet crude - Crude oil containing very little sulfur or sulfur compounds.

Sweet gas - Natural gas free of significant amounts of hydrogen sulfide (H_2S) when produced.

Total suspended solids (TSS) - The total content of suspended and dissolved solids in water.

Turbidity - Reduced water clarity resulting from the presence of suspended matter.

Ultra-large crude carrier (ULCC) (sometimes called a supertanker) - A tanker in excess of 300,000 dead weight tons.

Undiscovered resources - Quantities of oil and gas estimated to exist outside known fields.

Unexposed coastline - That shoreline bordered by sheltered waters, particularly where an embayment creates a calmer sea state. Direct exchange of seawater is limited by coastal inlets of about two or less miles across (Visual No. 14).

Unit - Administrative consolidation of OCS leases held by one or more companies but explored, developed, and/or produced as one lease by one operator for purposes of conservation, eliminating unnecessary operations, and/or maximizing resources recovered.

Vascular plants - Plants containing food and water conducting structures; higher plants which reproduce by seeds.

Very large crude carrier (VLCC) - A crude oil tanker of 160,000 dead weight tons or larger, capable of carrying one million barrels or more.

Vulnerability - The likelihood of being damaged by external influences. Vulnerability implies sensitivity of a system plus the risk of a damaging influence occurring.

Water test areas - Areas established within the Eastern Gulf where research, development, and the testing of military planes, ships, and weaponry takes place.

Weathering - The aging of oil due to its exposure to the atmosphere, causing marked alterations in its physical and chemical makeup.

Western Analysis Area - The Western Planning Area plus the Western Coastal Area.

Western Coastal Area - The onshore and coastal state water areas of Texas.

Western Planning Area - The sale area offshore Texas.

Western subplanning area - A discrete subarea within the larger offshore planning area.

Wetlands - Areas periodically inundated or saturated by surface or groundwater and supporting predominantly vegetation typically adapted for life in saturated soil conditions.

SECTION IX

APPENDICES

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IX

Appendix A

Blocks Affected by the Biological Stipulations in the Central and Western Gulf of Mexico

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Central Gulf of Mexico

Some 198 blocks of the Central Gulf would be affected by the stipulation, 114 of which are currently leased. The blocks affected, leasing status, and the affected bank follow:

West Cameron, South Addition

Block	OCS-G No. (if leased)	Bank
569		29 Fathom
570	5188	29 Fathom
589	5352	29 Fathom
590		29 Fathom
591	6600	29 Fathom
592	6601	29 Fathom
611	6603	29 Fathom
612	2557	29 Fathom and MacNeil
613	3286	MacNeil
614	6604	MacNeil
633	2238	MacNeil
634		28 Fathom
635		28 Fathom
636	4202	Bright
637	4097	Bright
638	2026	Bright
645	3973	Geyer
646	4411	Geyer
648	4268	Bright
649		Bright
650	6606	Bright
651		Bright
652		28 Fathom and Bright
653		28 Fathom
654	6607	28 Fathom
655		28 Fathom and Bright
656	6608	Bright
657		Bright
658	6609	Bright
659	6610	Bright
660	6611	Bright
661	6612	Bright
662		Bright and 28 Fathom
663	6613	28 Fathom

East Cameron, South Addition

Block	OCS-G No. (if leased)	Bank
361	5396	18 Fathom
362	6656	18 Fathom
363	6656	18 Fathom
377		18 Fathom
378	6660	18 Fathom
379		18 Fathom

Vermilion, South Addition

Block	OCS-G No. (if leased)	Bank
284		Sonnier
285		Sonnier
286		Sonnier
297	4804	Sonnier
298		Sonnier
299		Sonnier
300		Sonnier
303	4805	Sonnier
304		Sonnier
305		Sonnier
306	4426	Sonnier
317		Sonnier
318	4427	Sonnier
319		Sonnier
320	2087	Sonnier
361	5448	Bouma
362	5449	Bouma
363		Bouma
369	2274	Bouma
370	2275	Bouma
371		Bouma
372	2576	Bouma
382		Bouma and Rezak
383		Bouma and Rezak
384		Bouma
385	5452	Bouma
386	2278	Bouma
387		18 Fathom
388		18 Fathom
389	6684	18 Fathom
390		18 Fathom
391		18 Fathom and Bouma
392	3329	Bouma
393		Bouma and Rezak
394		Bouma and Rezak
395	5453	Rezak
396		Rezak
403		Rezak
404		Rezak
405		Rezak
406		Rezak and Bouma
407	3142	Bouma
408		18 Fathom
409		18 Fathom
410		18 Fathom
411		Sidner and Rezak
412	6685	Sidner and Rezak

South Marsh Island, South Addition

Block	OCS-G No. (if leased)	Bank
158		Fishnet
159		Fishnet
161	4809	Alderdice
162	4810	Alderdice
163		Alderdice
169		Alderdice
170		Alderdice
171	5467	Alderdice
172	4811	Alderdice
173	2887	Alderdice
174	2888	Fishnet
176	5221	Alderdice
177	5468	Alderdice
178		Alderdice
179		Alderdice
180		Alderdice
185		Alderdice and Parker
186		Alderdice and Parker
187		Alderdice and Parker
188	5469	Alderdice and Parker
193	6694	Parker
194	6695	Parker
195		Parker
196		Parker
197		Parker
200		Parker
201		Parker
202		Parker
203		Parker
204	5474	Parker

Eugene Island, South Addition

Block	OCS-G No. (if leased)	Bank
334	5519	Fishnet
335	6723	Fishnet
336	5521	Fishnet
354	3573	Fishnet
355		Fishnet
356	5522	Fishnet
357		Fishnet
358	5523	Fishnet
359	5524	Fishnet
381		Jakkula
382		Jakkula
383		Jakkula
390	6730	Jakkula
391	6731	Jakkula
397	5529	Jakkula

Ship Shoal, South Addition

Block	OCS-G No.(if leased)	Bank
325	5574	Ewing
326	5575	Ewing
327	6753	Ewing
328	6754	Ewing
329		Ewing
332	4826	Diaphus
334		Ewing
335		Ewing
336	6756	Ewing
337		Ewing
338		Ewing
339	6757	Ewing
348	5579	Ewing
349		Ewing
350		Ewing
351	5580	Ewing
352	5581	Ewing
353	6759	Ewing
355	5583	Diaphus
356	5206	Ewing
357	5584	Ewing
358	5585	Ewing
359	5586	Ewing

South Timbalier, South Addition

Block	OCS-G No. (if leased)	Bank
300	4240	Diaphus
301	3594	Diaphus
313		Diaphus
314	5225	Diaphus
315		Diaphus
316	5649	Diaphus
317	5650	Diaphus
318		Diaphus

West Delta, South Addition

Block	OCS-G No. (if leased)	Bank
142		Sackett
143	4475	Sackett
144	6789	Sackett
146		Sackett
147	4476	Sackett
148	4477	Sackett
149	5683	Sackett
154		Sackett

Green Canyon

Block	OCS-G No. (if leased)	Bank
4	5529	Jakkula
5	6986	Jakkula
6	6987	Jakkula
7	6988	Jakkula
49	7002	Jakkula
50		Jakkula
90	4503	Sweet

Ewing Bank

Block	OCS-G No. (if leased)	Bank
903	5803	Ewing
906		Diaphus
907	6908	Diaphus
908	6909	Diaphus
932	6914	Jakkula
933	6914	Jakkula
944	5809	Ewing
945	6917	Ewing
947	5803	Ewing
950		Diaphus
951	5811	Diaphus
952	5812	Diaphus
975	6730	Jakkula
976		Jakkula
977	6926	Jakkula

Mississippi Canyon

Block	OCS-G No. (if leased)	Bank
316	5833	Sackett
317	6945	Sackett
318		Sackett
360	6947	Sackett
361	6948	Sackett

Western Gulf of Mexico

Some 238 blocks of the Western Gulf would be affected by the stipulation, 135 of which are currently leased. The blocks affected, leasing status, and the affected bank follow:

North Padre Island, East Addition

Block	OCS-G No. (if leased)	Bank
A-24		Dream
A-25		Dream
A-29	5968	Dream
A-30	5969	Dream
A-31	5970	Dream
A-32		Dream
A-39		Dream
A-40	5971	Dream
A-41	5972	Dream
A-42	2995	Dream
A-45	7152	Dream
A-46	7153	Dream
A-47		Dream
A-48		Dream
A-72	5977	Blackfish Ridge
A-83	7159	Mysterious
A-84	7160	Mysterious

Mustang Island

Block	OCS-G No. (if leased)	Bank
A-1	6016	North Hospital
A-3		North Hospital
A-4		North Hospital and Hospital
A-7		Southern
A-8		Hospital and Southern
A-9		Southern
A-10	7175	Southern
A-15	7179	Southern
A-16	3011	Southern
A-17		Southern
A-18	5167	Southern

Mustang Island, East Addition

Block	OCS-G No. (if leased)	Bank
A-54		Small and Big Dunn Bars
A-55		Baker
A-56		Baker
A-57		Baker
A-60	4989	Baker
A-61		Baker

Mustang Island, East Addition (continued)

Block	OCS-G No. (if leased)	Bank
A-62		Baker
A-63		Baker
A-85	3061	Baker
A-86		Baker and South Baker
A-87		Baker and South Baker
A-88		Baker and South Baker
A-94	7185	South Baker
A-95		South Baker
A-96		Baker and South Baker
A-97		Baker
A-111	3068	South Baker
A-112		South Baker
A-113	7189	South Baker
A-114		Aransas
A-115		Aransas
A-116		Aransas and North Hospital
A-117	4697	Aransas and North Hospital
A-118	4698	Aransas
A-119		Aransas
A-134		Aransas and Hospital
A-135	6028	Aransas, Hospital, and North Hospital
A-136		Aransas, Hospital, and North Hospital
A-137		Hospital
A-138	7192	Hospital
A-151	4990	Hospital and Southern
A-152	4991	Southern
A-163		Southern

High Island, South Addition

Block	OCS-G No. (if leased)	Bank
A-447	2360	Claypile
A-448	2361	Claypile
A-463	7337	Claypile
A-464		Claypile
A-486	6227	Stetson
A-487	4743	Stetson
A-488	6228	Stetson
A-501	6233	Stetson
A-502	7339	Stetson
A-503	6235	Stetson
A-512		Stetson
A-513		Stetson
A-514		Stetson
A-527		Stetson
A-528		Stetson
A-529		Stetson

High Island, South Addition (continued)

Block	OCS-G No. (if leased)	Bank
A-534		32 Fathom
A-535		32 Fathom
A-573	2393	West Flower Garden
A-578	4589	Applebaum
A-579	5012	Applebaum
A-580		Applebaum
A-589	7351	Applebaum
A-590		Applebaum
A-591	7352	Applebaum
A-596	2722	West Flower Garden

High Island, East Addition, South Extension

Block	OCS-G No. (if leased)	Bank
A-311	6[illegible]50	29 Fathom
A-312	2409	29 Fathom
A-327	2418	29 Fathom
A-328		29 Fathom
A-329	6253	29 Fathom
A-330	2421	29 Fathom
A-331		29 Fathom
A-332	2422	29 Fathom
A-340	2426	Coffee Lump
A-346	4190	MacNeil
A-347		MacNeil
A-348		MacNeil
A-349	2743	MacNeil
A-350	2428	MacNeil
A-351	2429	MacNeil and East Flower Garden
A-352		East Flower Garden and MacNeil
A-353	7362	East Flower Garden
A-354		East Flower Garden
A-355	2745	East Flower Garden
A-358	6255	Coffee Lump
A-359		Coffee Lump
A-360		Coffee Lump
A-361		Coffee Lump and West Flower Garden
A-362	7364	West Flower Garden
A-363		West Flower Garden
A-364	6256	East and West Flower Garden
A-365	2750	East Flower Garden
A-366	7365	East Flower Garden
A-367	7366	East Flower Garden
A-368	2433	East Flower Garden and MacNeil
A-369	2751	MacNeil and 28 Fathom
A-370	2434	MacNeil and 28 Fathom

High Island, East Addition, South Extension (continued)

Block	OCS-G No. (if leased)	Bank
A-371		28 Fathom
A-372		28 Fathom and MacNeil
A-373	7367	East Flower Garden, 28 Fathom, and MacNeil
A-374	5108	East Flower Garden
A-375		East Flower Garden
A-376	2754	East Flower Garden
A-377	6258	East and West Flower Garden
A-378	3953	West Flower Garden
A-379		West Flower Garden
A-380	7369	West Flower Garden
A-381		West Flower Garden
A-382	2757	West Flower Garden
A-383	6259	West Flower Garden
A-384	3316	West Flower Garden
A-385	5109	West Flower Garden
A-386		East and West Flower Garden
A-387		East Flower Garden
A-388	6260	East Flower Garden
A-389	2759	East Flower Garden
A-390		East Flower Garden and 28 Fathom
A-391		28 Fathom
A-392	6261	28 Fathom
A-393	7370	28 Fathom
A-394		East Flower Garden
A-395	7371	East Flower Garden
A-396	7372	East and West Flower Garden
A-397	3955	West Flower Garden
A-398		West Flower Garden
A-399	7373	West Flower Garden
A-400	6263	West Flower Garden
A-401	6264	West Flower Garden
A-402	6265	West Flower Garden
A-403	6266	East Flower Garden

East Breaks

Block	OCS-G No. (if leased)	Bank
121		Applebaum
122	6271	Applebaum
123	7388	Applebaum
124		Applebaum
165	6280	Applebaum
166	6281	Applebaum
167	7392	Applebaum
168	7393	Applebaum
173	6284	West Flower Garden
217	7399	West Flower Garden

Garden Banks

Block	OCS-G No. (if leased)	Bank
26		18 Fathom
27	7431	18 Fathom
28	7432	18 Fathom
29	7433	18 Fathom
30	7434	Rezak and Sidner
31	7434	Rezak and Sidner
33		Rezak and Sidner
61		Geyer
62		Geyer
63		Geyer
70		18 Fathom
71		18 Fathom
72	7435	18 Fathom
73	7436	18 Fathom
74	7437	Sidner
75	7438	Sidner
76		Sidner
77	6328	Sidner
81		Parker
82	6329	Parker
83	6330	Parker
84	6331	Parker
85		Parker
95	6332	East Flower Garden
96	6333	East Flower Garden
97		East Flower Garden and 28 Fathom
98		28 Fathom
102		Bright
103	6334	Bright
104	6335	Geyer
105		Geyer
106		Geyer
107		Geyer
108	6336	Geyer and Elvers
109	6337	Elvers
110	6338	Elvers
119	6340	Sidner
120		Sidner
121	6341	Sidner
126	6343	Parker
127	6344	Parker
128	6345	Parker
133		West Flower Garden
134		West Flower Garden
135	6346	West Flower Garden
136		West Flower Garden
138		East Flower Garden
139	6347	East Flower Garden

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Garden Banks (continued)

Block	OCS-G No. (if leased)	Bank
140	6348	East Flower Garden
141		28 Fathom
142		28 Fathom
144		Bright
145		Bright
146		Bright
148	6350	Geyer
149	7440	Geyer
150		Geyer
151		Geyer
152	7441	Geyer and Elvers
153		Elvers
154		Elvers
155		Elvers
177	6355	West Flower Garden
178	6356	West Flower Garden
179		West Flower Garden
180	7444	West Flower Garden
192	3301	Geyer
193	4130	Geyer
194		Geyer
195	7445	Geyer
196	7446	Geyer and Elvers
197	7447	Elvers
198		Elvers
237	2812	Geyer
238		Geyer
239	6367	Geyer

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Appendix B

Recent MMS Publications Used as Supporting Documentation in EIS 104/105

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The following are summaries of 21 documents recently published by the Minerals Management Service (MMS), Gulf of Mexico Outer Continental Shelf (OCS) Region in 1984 and 1985. These documents are considered by MMS as incorporated supporting documents to this EIS for Sales 104 and 105 in the Central and Western Gulf of Mexico. These documents are available for sale at the cost of printing or in certain cases are free of charge from:

Public Information Service
Gulf of Mexico OCS Region
Minerals Management Service
Post Office Box 7944
3301 N. Causeway Boulevard
Metairie, Louisiana 70010
(504) 838-0932 (FTS) 680-9932

1. Oil and Gas Leasing Procedures Guidelines. U.S. Department of Interior (USDI), Minerals Management Service. March 1984. OCS Report/MMS 84-0011. 189 p.

These Guidelines are designed to aid those interests doing business with the Federal Government on the OCS Oil and Gas Leasing Program. Its primary purpose is to guide business interests in preparing legal documents to:

(a) become qualified to participate in the OCS oil and gas program;
(b) acquire oil and gas leases on the OCS; and
(c) acquire and transfer title interests in oil and gas leases on the OCS.

2. Outer Continental Shelf Statistical Summary (1979). USDI, Minerals Management Service. Revised September 19, 1984. OCS Report/MMS 84-0046. $5.00.

The statistical summary provides selected data on OCS lease sales and also bid recaps for OCS Sales 49, 48, 58, 58A, BF, and 42. The bid recaps include such information as the tract number, OCS number, block number, group number, company name and the company's percentage of participation in a bid, bid per hectare, total bid, bid standing, and total amount of money exposed per tract.

3. Outer Continental Shelf Statistical Summary (1981). USDI, Minerals Management Service. Revised September 18, 1984. OCS Report/MMS 84-0048. $5.00.

The statistical summary provides selected data on OCS lease sales and also bid recaps for OCS Sales 53, RSI, A66, 56, 60, 66, and 59. The bid recaps include such information as the tract number, OCS number, block number, group number, company name and the company's percentage of participation in a bid, bid per hectare, total bid, bid standing, and total amount of money exposed per tract.

4. Pipeline Guidelines and Procedures. USDI, Minerals Management Service. March 1984. OCS Report/MMS 84-0015. 81 p.

These guidelines are designed to aid the application for pipeline under the jurisdiction of the MMS, Gulf of Mexico OCS Regional Office. The guidelines are prepared in two parts. Part 1 outlines the preparation of applications for right-of-way pipelines under 30 CFR 256. Part 2 outlines the preparation of applications for lease term and permit pipelines under 30 CFR 250.20.

5. Proceedings, Fourth Annual GOM Information Transfer Meeting (ITM) (November 1983). USDI, Minerals Management Service. October 1984. OCS Report/MMS 84-0026. 474 p.

The purpose of these Proceedings is to present an overview of major Gulf of Mexico environmental programs and findings represented at the MMS Fourth Annual ITM Meeting held November 15-17, 1983. In order to keep this document to a manageable size, technical descriptions and study results were edited to provide the briefest description of overall objectives. As a result, the Proceedings should be viewed as a reference to studies programs rather than a presentation on their complete technical content. Further explanations of study objectives and findings should be obtained from either the individual investigator or the responsible government agency. It should be noted that under the presentation titles are the names of the speaker and their respective affiliations. A complete address for all speakers and participants is included in the List of Attendees.

6. Proceedings. Winter Ternary Gulf of Mexico Studies Meeting. USDI, Minerals Management Service. February 1984. OCS Study/MMS 84-0033. 69 p.

This report provides information and abstracts for the Winter Ternary Meeting held at the MMS Building in New Orleans, Louisiana, in February 1984. Included is a Meeting Summary, Abstract of Presentations, and a List of Attendees.

7. Shallow Gas Events. John Pucker, Lionel Nunermacher, and Warren Williamson. July 1984. USDI, OCS Report/MMS 84-0029. 32 p.

All information available on drilling encounters with shallow gas on the Gulf OCS has been accumulated and analyzed in this report. Similar causes for failure to maintain well control are categorized, and basic recommendations designed to eliminate repetition of these situations are given. Also, recommendations for equipment, methods, and procedures to be used for safer drilling in areas prone to have shallow gas accumulations are included in this report.

8. Shallow Geology of the Continental Shelf and Upper Continental Slope, Port Arthur. H. L. Berryhill, Jr. et al. 1984. USDI, OCS Map/MMS 84-0003. 8 oversize sheets, scale 1:250,000. $15.00.

This map series consists of eight sheets at a scale of 1:250,000 covering the Port Arthur quadrangle. The topics covered include location of seismic profiles; distribution of ancient fluvial sediments of probable early and late Wisconsinan Age; location of diapers, fold axes, and faults; location of faults and distribution of shallow gas in sediments; relative bottom hardness; distribution and thickness of Holocene sediments; structure contours on early Wisconsin low stand surface; and the thickness of post early Wisconsinan to Holocene sediments.

9. Southwest Florida ecological characterization atlas. USDI, Fish and Wildfife Service/ Minerals Management Service. 1984. OCS Map/MMS 84-0008. 90 maps. 329 p. Map narratives. $50.00.

The Ecological Atlas consists of a narrative volume and a series of base maps and data set overlays. The narrative volume provides explanatory material as well a the sources of mapped information. The 1:100,000 scale maps cover the coastal region of Southwest Florida from Pasco County in the north to Monroe County in the south, including the Florida Keys and Dry Tortugas. Each map quadrangle is composited with each of five data sets: biological resources; socioeconomic features; soils and landforms; oil/gas and mineral resources; and hydrology and climatology.

10. Taxonomic Guide to the Polychaetes of the Northern Gulf of Mexico. USDI, Minerals Management Service. December 1984. OCS Study/MMS 84-0049. 7 vol. $50.00.

This report, which consists of seven volumes, includes an introduction to the project and taxonomic keys, with illustrated descriptions of all polychaetes known from the Gulf. Sixty families of polychaetes are considered, including many new species and genera.

11. Estimated Oil and Gas Reserves, Gulf of Mexico OCS and Continental Slope, December 31, 1983. Jack Hewitt et al. 1984. USDI, OCS Report/MMS 84-0020. 21 p.

This report presents estimates of original recoverable reserves, cumulative production, and remaining recoverable reserves as of December 31, 1983. The estimates of reserves for this report were completed in April 1984 and represent the combined efforts of engineers, geologists, paleontologists, and other personnel of the MMS in Metairie, Louisiana. As in previous reports, standard methods of estimating reserves were used, including volumetric calculations, decline curve analysis, material balance, and mathematical simulation.

12. Environmental Assessment for Geological and Geophysical Exploration Activities on the OCS. USDI, Minerals Management Service. September 1984. OCS Report/MMS 84-0051.

This programmatic Environmental Assessment (EA) has been prepared for geological and geophysical (G&G) activities, including the conducting of exploration for mineral resources or scientific research involving the use of liquid or solid explosives and the drilling of deep stratigraphic test (DST) holes on the Gulf OCS. It will serve as a base document for the preparation of future environmental documents.

Pursuant to Appendix 10 of 516 DM 6, certain actions are categorically excluded from the National Environmental Policy Act (NEPA) process, including approval of OCS G&G activities. Exceptions to the categorical exclusion process are those activities which include the drilling of DST holes, which involve the use of solid or liquid explosives, or which otherwise have the potential to significantly affect the quality of the human environment. A Site-specific Environmental Assessment (SEA) will be prepared for these activities and will contain site-specific and updated information not presented in this EA. Sections of this EA which will be covered or supplemented in an SEA are indicated throughout the text.

13. Accidents Connected with Federal Oil and Gas Operations on the Gulf of Mexico (January 1980 - June 1984). USDI, Minerals Management Service. December 1984. OCS Report/MMS 84-0072. Vol. 2.

This report provides the reader with five tables of data on five classifications of accidents that may occur as a result of oil and gas operations on the Gulf OCS. The classes are: (1) blowouts; (2) explosives and fire; (3) pipeline breaks/leaks; (4) oil spills; and (5) major accidents. Descriptions of each accident are provided in tabular form for the time period covered by this 86-page report.

14. Draft Environmental Impact Statement (Draft EIS) Proposed Oil and Gas Lease Sales 94, 98, and 102. USDI, Minerals Management Service. July 1984. OCS EIS/MMS 84-0019. 2 vol.

The Draft EIS covering the proposed OCS oil and gas sales in the Gulf for 1985 is a product of the MMS, Gulf of Mexico OCS Region. This document discusses the purpose and background of the proposed actions, the alternatives including the proposed actions, the description of the affected environment, and the environmental impacts of proposed Central Gulf of Mexico Sale 98 (May 1985), Western Gulf of Mexico Sale 102 (August 1985), and Eastern Gulf of Mexico Sale 94 (November 1985). This draft document is offered to the public for the review and comment leading to the preparation of a Final EIS.

15. Final EIS for Proposed Oil and Gas Lease Sales 94, 98, and 102. USDI, Minerals Management Service. December 1984. OCS EIS/MMS 84-0057.

The Final EIS covering the proposed OCS oil and gas sales in the Gulf of Mexico for 1985 is a product of the MMS, Gulf of Mexico OCS Region. This document discusses the purpose and background of the proposed actions, the alternatives including the proposed actions, the description of the affected environment, and the environmental impacts of proposed Central Gulf of Mexico Sale 98 (May 1985), Western Gulf of Mexico Sale 102 (August 1985), and Eastern Gulf of Mexico Sale 94 (November 1985).

16. Final Area-wide Environmental Assessment (AEA), Exploration Activities, Northeast Section of Eastern Planning Area (EPA). January 1985. OCS Report/MMS 85-0007.

This AEA has been written for exploratory activity occurring in those blocks of the EPA of the Gulf OCS contained in the following areas: Gainesville, Tarpon Springs, and those portions of Apalachicola, The Elbow, Florida Middle Ground, and St. Petersburg that lie shoreward of the 1,000 m (3,281 ft) isobath to the west of the 85.5°W longitude and north of the 27.5°N latitude. This AEA will serve as a base document for exploratory activity proposed within the environmental assessment area. An SEA will be prepared for each Plan of Exploration (POE) submitted for activities within the AEA area. The SEA's will contain site-specific and updated information not presented in the AEA. Sections of the AEA which will be covered or supplemented in an SEA are indicated throughout the text.

17. Final AEA, Exploratory Activities, Northwest Section of the EPA, Gulf of Mexico Region. May 1984. OCS Report/MMS.

This AEA is written for exploration activity occurring in those blocks of the EPA of the Gulf OCS contained in the following areas: Pensacola, Destin Dome, and those portions of De Soto Canyon, Apalachicola, and the Florida Middle Ground that lie shoreward of the 1,000 m (3,281 ft) isobath between 85.5°W longitude to the east and the Mobile-Destin Dome area boundary to the west. This AEA will serve as a base document for exploratory activity proposed within the environmental assessment area. An SEA will be prepared for each POE submitted for activities within the AEA area. The SEA's will contain site-specific and updated information not presented in the AEA. Sections of the AEA which will be covered or supplemented in an SEA are indicated throughout the text.

18. Draft Regional Studies Plan, Fiscal Year 1986. USDI, Minerals Management Service. June 1984. OCS Report/MMS 84-0025. 219 p.

The Regional Studies Plan (RSP) addresses information needs regarding oil and gas production in the Gulf of Mexico. These information needs have been identified by the MMS staff, other Federal Agencies, coastal states, representatives of industry and private agencies, and environmentalists and private individuals. The studies are specifically designed to provide information for management decisions both before and after lease sales in the Gulf OCS leasing areas. The study development processes are a continuing effort and recognize the need for modification, addition, or deletion of studies identified in the RSP as information is developed by other studies, as new environmental or management concerns are recognized, and as modifications in the OCS leasing process are implemented.

19. Fishing Offshore Platforms, Central Gulf of Mexico. Robert B. Ditton and Janice Auyong. April 1984. USDI, OCS Monograph/MMS 84-0006. 158 p. $6.00; NTIS PB 84-216605 (paper $16.00, fiche $4.50).

This monograph is an adjunct to information provided in Gulf lease sale EIS's. It reports on offshore fishing patterns derived from data collected in 1980-1981 on the fishing use directly associated with several hundred oil and gas production platforms located from 3 to more than 100 miles off the coast of Louisiana. Insight is provided into the relative abundance of plaform fishing activity by major fishing group (private boats, charter and party boats, scuba boats, commercial boats, and offshore workers), home state of boat fishermen, where they go (depth and distance), when they fish, how they fish, and what species constitute their principal catch. By subdividing the study area into three analysis zones, the investigation effectively shows that demographics, transportation, access, shelf characteristics, and the interrelationship of these factors influence the amount and location of offshore "rig" fishing.

20. Final AEA, Exploration and Production Activities 4-mile Zone of the East and West Flower Garden Banks. USDI, Minerals Management Service. October 1984. OCS Report/MMS 84-0053. 156 p.

This AEA is written for exploration, development, and production activity occurring within the 4-mile zone of the East and West Flower Garden Banks. This AEA will serve as a base document for oil and gas activity proposed within the environmental assessment area. An SEA will be prepared for each operational plan submitted for activities within the AEA area. The SEA's will contain site-specific and updated information not presented in the AEA. Sections of the AEA which will be covered or supplemented in an SEA are indicated throughout the text.

21. Maps Published by MMS/Gulf of Mexico OCS Regional Office. 1984. Lawrence Handley and Connie Good. 10 p.

This report is a directory of available published maps supporting the environmental data base of the leasing program in the Gulf of Mexico. Maps concerned with the following subjects are listed: topography, geology, sediment instability, hurricanes, geothermal energy, biology, recreational fishing, EIS visuals, and marine reefs.

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Appendix C

Biological Opinions

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United States Department of the Interior
FISH AND WILDLIFE SERVICE
75 SPRING STREET, S.W.
ATLANTA, GEORGIA 30303

January15, 1985

MEMORANDUM

TO: Director, Minerals Management Service, Reston, Virginia

FROM: Acting Regional Director, FWS, Atlanta, Georgia (AFA/SE)

SUBJECT: Section 7 Consultation on Outer Continental Shelf Oil and Gas Leasing and Exploration in the Gulf of Mexico

We have reviewed the information that was provided for Outer Continental Shelf (OCS) leasing sales numbers 104 and 105. We concur that these sales do not represent a substantive modification of the proposal actions considered in earlier regionwide consultations on April 10, 1979, June 30, 1982, and the October 25, 1984, amendment to the June 30, 1982, opinion.

Therefore, we concur that formal consultation for these sales need not be initiated at this time. However, the Minerals Management Service is reminded that formal Section 7 consultation must be initiated if new information reveals impacts on listed species or their habitats for these OCS sales that were not considered in this review, if these proposed OCS sales are subsequently modified, or if a new species is listed or critical habitat is designated which may be affected by these proposed OCS sales.

ADDRESS ONLY THE DIRECTOR
FISH AND WILDLIFE SERVICE

United States Department of the Interior

FISH AND WILDLIFE SERVICE
WASHINGTON, D.C. 20240

In Reply Refer To:
FWS/OES MMS-82-1

OCT 25 1982

MEMORANDUM

To: Director, Minerals Management Service

From: Chief, Office of Endangered Species

Subject: Amended Biological Opinion for the Lease and Exploration of Outer Continental Shelf Lands in the Gulf of Mexico Region

By memorandum received November 10, 1981, the Bureau of Land Management (BLM) and the Geological Survey (GS), now a part of the Minerals Management Service (MMS), requested the reinitiation of formal consultation with the U.S. Fish and Wildlife Service (FWS) under Section 7(a) of the Endangered Species Act to consider all of the operations pertaining to Outer Continental Shelf (OCS) oil and gas leasing and exploration in the Gulf of Mexico OCS Planning Area.

An original Section 7 consultation on the lease and exploration of OCS lands in this area occurred in 1979 with a biological opinion being rendered to BLM and GS April 10, 1979 (copy attached). Consultation was reinitiated on the basis of an extension of the boundaries of the Gulf Region as well as on an oilspill analysis for the Region.

A consultation team consisting of Wayne Milstead, Office of Endangered Species (OES), Team Leader; Bob Cooke, FWS, Region 4 Office, Atlanta, Georgia; and Jim Barkuloo, FWS, Panama City, Florida, was appointed and attended a meeting with representatives of MMS in New Orleans on December 2-3, 1981. The consultation team requested information on any new potential onshore facilities in the Region and an analysis of the probability of oilspills occurring as a result of the action. Since the information was not forthcoming and the 90-day period for consultation had run out, a memorandum was sent to MMS on March 4, 1982, requesting that formal consultation be delayed until the information requested was made available. On March 13, 1982, the information requested was received from MMS, but as a result of subsequent conversations with MMS personnel it was discovered that the oilspill analysis had been revised. Final, up-to-date oilspill information was received in OES on April 13, 1982, at which time the formal consultation period was resumed.

[Following submission of a biological opinion on June 30, 1982, the FWS felt that new information received on the potential impacts of this project on listed species was sufficient to necessitate a revision, resulting in this amended version.]

The following listed Endangered or Threatened species were considered during this consultation as being potentially affected by the action: bald eagle (*Haliaeetus leucocephalus*), brown pelican (*Pelecanus occidentalis*), loggerhead sea turtle (*Caretta caretta*), Kemp's (=Atlantic) Ridley sea turtle (*Lepidochelys kempii*), West Indian (Florida) manatee (*Trichechus manatus*) and its Critical Habitat, [American crocodile (*Crocodylus acutus*) and its Critical Habitat,] and whooping crane (*Grus americana*) and its Critical Habitat. [The status of other species included in the April 10, 1979, biological opinion has not changed substantially. The extension of the lease area and the oilspill risk analysis will not result in changes in the 1979 opinion for these species.]

The Gulf area involved in this consultation includes the outer continental shelf lands not presently under lease that are north of a line running east from approximately the U.S.-Mexican border on the coast at 26 degrees north latitude to 88 degrees west longitude where it jogs north 1 degree latitude, then east again 2 degrees west longitude to 86 degrees west longitude with another diversion south 2 degrees latitude to 25 degrees north latitude and finally east toward the Florida coast until a final jog north along 82 west degrees longitude intersects the Florida coast just south of Charlotte Harbor (Figure 1). This consultation considers the effect of all activities associated with the lease and exploration of lands within this area on listed Endangered and Threatened species under the jurisdiction of the FWS.

[A major change which brought about the reinitiation of the previous consultation was the addition of a "frontier" lease area off southwest Florida between 26 degrees and 25 degrees north latitude. In addition, new information on Gulf-wide OCS activities was provided in the form of an oilspill risk analysis for the development/production phase in the region. This opinion, therefore, concentrates on those species which are within or adjacent to this "frontier" area. Comments will generally reference the previous biological opinion of April 10, 1979, and the statements in that opinion stand unless new information necessitates additional comment or allows a change in any part of that opinion.]

Exploration of the OCS requires certain onshore facilities that might include office space, helicopter and fixed-wing aircraft facilities, boat docks, and support bases. There is an extensive history of intensive oil and gas activity in the Gulf of Mexico, and numerous onshore facilities have been established throughout the Region. The availability and necessity of onshore facilities appears to remain as they were at the time of our April 10, 1979, biological opinion, and it would seem unlikely that additional lease and exploration of the OCS in the Gulf Region will result in the development of additional onshore support facilities. Should the use of existing facilities be changed or additional onshore facilities be needed which may affect listed species or their habitats, consultation must be reinitiated.

Although not available for the 1979 consultation, an oilspill risk analysis has been provided for this reinitiation. It gives the percent probability that one or more spills of 1000 barrels or more will occur, from a variety of sources, during the life of the project and that they will strike various targets and/or land segments along the Gulf Coast within 3, 10, or 30 days after initiation of the spill. This analysis is based on activities that can be expected to be associated with the development and production phases of the project following lease and exploration, and this consultation is on the lease and exploration phases only. Probabilities are broken down into spills expected to result from three cumulative categories of events: (1) the proposed lease sale only, (2) the proposed sale plus existing leased OCS lands, and (3) the proposed sale plus existing leased lands, as well as oil imports moving through the lease area. The life of the proposal is considered to be 40 years. If the third category of events leading to oilspills that will strike various targets within 30 days (proposed sale, existing activities, and imported oil) is considered the worst case situation, some figures are very high. This is particularly true of land segments in the western Gulf where probabilities from the proposed lease alone are from 13 percent at Aransas County, Texas (whooping crane wintering range), to 67 percent at Saint Bernard Parish, Louisiana (a brown pelican nesting site); and if existing leased lands plus imported oil are included, these figures increase respectively to 51 percent and 93 percent.

Although the general statements and considerations provided for each species in the 1979 biological opinion are still appropriate, [the addition of a "frontier" area and] the introduction of oilspill data necessitates an additional consideration of potential impacts on some species. [The West Indian manatee, American crocodile, brown pelican, and loggerhead sea turtle are the species most likely to be impacted as a result of the extended lease area. Other limited species are considered here because of the potential for impacts as oil and gas activities increase throughout the Region.]

Bald Eagle (Haliaeetus leucocephalus)

The discussion in the 1979 biological opinion regarding the possible contamination of the bald eagle's food source by an oilspill is emphasized by the high probabilities of such spills reaching segments of the Texas and Louisiana coast in reasonable proximity to bald eagle nesting territories. It can be expected that bald eagles might be attracted to the area of a spill by dead and dying fish and birds as a food source and thereby consume oil adhering to prey species. Nevertheless, evidence from other species of birds suggests that adult birds may be able to tolerate the ingestion of fairly high concentrations of crude oil. Also, the direct effect of oil on plumage is perhaps not as significant a factor with bald eagles since adults, at least, tend to have minimal contact with the water from which they are taking prey.

However, the more important adverse impact of an oilspill on bald eagles would probably be on reproduction through contamination of eggs from adults carrying oil on breast.feathers and feet.

Nesting territories are found in or near Refugio (land segment 6), Calhoun (land segment 7), Matagorda (land segment 8), and Brazoria (land segment 9) Counties, Texas, and the relatively high probabilities of oilspills striking these areas (13 percent, 24 percent, 45 percent, and 32 percent respectively) are of concern. Similarly, active bald eagle nesting in the Mississippi delta region of Louisiana from land segments 16 to 21, along with associated oilspill probabilities of 54 percent, 40 percent, 17 percent, 86 percent, 67 percent. and 31 percent respectively suggests a high level of threat to the recoverability of the species in the western Gulf Region. [The status of this species in the eastern and central Gulf Regions is essentially the same as discussed in the 1979 biological opinion.]

Brown Pelican (Pelecanus occidentalis)

Few brown pelican nesting sites remain in the western Gulf of Mexico. Three sites exist along the Texas coast, Pelican Island, Nueces County (land segment 5), and Second Chain of Island and Sundown Island, Calhoun County (land segment 7). Also, pelicans range over much of the Texas coast from land segment 4 (Kleberg County) north to land segment 8 (Matagorda County). Probabilities of oilspills resulting from the proposed sale striking land segments 5, 6, and 7 are 22 percent, 13 percent, and 24 percent respectively. These figures are increased to 44 percent, 51 percent, and 61 percent when oil from existing leased OCS lands and oil imports are included as a factor.

In Louisiana, only two small restored nesting colonies exist, one on Queen Bess Island, Jefferson Parish (land segment 18) and the other on North Island, Saint Bernard Parish (land segment 20). The probability of oilspills from the proposed lease activity striking these two segments is 17 percent and 67 percent respectively.

When the effects of existing leased OCS lands and imported oil is included, these probabilities increase to 69 percent and 93 percent. Such high values nearly assure that one or both of these two fragile nesting sites will be affected by one or more oilspills of 1000 barrels or more within 30 days after release over the 40 years of the project. Even though all these island nesting sites in Texas, as well as in Louisiana, might be partially protected from the direct impact of an oilspill in the open Gulf by seaward barrier islands, the wide-ranging nature of the birds when foraging would amplify the possibility of oil contamination. The most damaging effect of oil contamination on brown pelicans would be on reproduction. Due to the bird's feeding habits, it is reasonable to assume that adult brown pelicans might in fact avoid feeding in oiled waters because of the difficulty of their observing fish beneath the surface. But very small amounts of certain crude and refined oils applied to the surface of eggs cause high embryonic mortality or morphological abnormalities in a variety of avian species. If spills occurred during the nesting season of the brown pelican, oil can be transferred to eggs from feathers or feet of adults resulting in reduction in hatching rate. As with bald eagles, the impact of oilspills on the recoverability of brown pelicans in the Texas-Louisiana coastal region could be substantial. [The status of the brown pelican in the eastern Gulf Region is essentially the same as discussed in the 1979 biological opinion.]

Whooping Crane (Grus americana)

The wintering range of the entire reproducing wild population of the whooping crane exists along a stretch of Texas coast, including a portion of the Critical Habitat (Aransas, Calhoun, and Matagorda Counties), subject to probabilities of being impacted by one or more substantial oilspills of 13 percent, 24 percent, and 45 percent during the life of the proposed lease of these OCS lands. These figures increase to 51 percent, 61 percent, and 86 percent when activities on existing leased lands plus imported oil are added to the oilspill analysis.

These birds feed largely on crabs and clams in tidal flats and shallow bays and channels while wading, and oiled waters in these habitats could pose a considerable threat if a spill occurred between November and late April when the cranes are on their wintering grounds. Again, as with brown pelican nesting sites, this wintering habitat of whooping cranes is protected to some extent from oilspills in the open Gulf by barrier islands, but the loss of even a relatively small portion of a population, estimated to consist of approximately 75 individuals, could have a drastic impact on the continued existence of the species.

Sea Turtles

[Recent studies on the effects of petroleum on the development and survival of marine turtle embryos are inconclusive. The results of these studies indicate that oil remaining on the beach approximately one year after a spill did not cause significant mortality in sea turtle eggs, however, fresh crude oil deposited on top of sand can cause extensive mortality to incubating sea turtle eggs. More definitive information is needed to assess impacts of oiling on sea turtle nesting beaches.]

Loggerhead Sea Turtle - (*Caretta caretta*)

Loggerhead sea turtles nest on several barrier islands along the Gulf coast, in some cases in considerable numbers. The probabilities of an oilspill from all potential sources striking some areas of known loggerhead nesting sites within 30 days are relatively high. For instance, the figures for the Chandeleur Islands, Louisiana (segment 20), has a probability from all sources of 93 percent and Santa Rosa Island, Florida (segment 24), has a probability of 36 percent. [The probability of oil reaching nesting beaches in the "frontier" lease area off Florida as a result of OCS leasing and exploration is near zero.]

Kemp's (=Atlantic) Ridley Sea Turtle - (*Lepidochelys kempii*)

Except for purported occassional nestings along the southern Texas coast, this species nests entirely along an approximately 14-mile stretch of Mexican coast.

Since 1978, the U.S. Fish and Wildlife Service has been involved in a project designed to return these turtles to nesting sites in the U.S. Eggs are collected in Mexico, transported to Padre Island National Seashore, and placed in artificial nests. After hatchlings move from these nests into the water, they are recaptured and raised in "head start" facilities until they are mature enough to be released into the Gulf. It is hoped that this procedure will result in turtles that are imprinted on Padre Island as a nesting site, and that they will return there when sexually mature at approximately 7 years of age. [The impacts of a fresh oilspill on nesting stages of the species would probably be significant if the oil hit the beaches during the nesting season.] The probability of a 1000 barrel or more oilspill striking some part of Padre Island within 30 days of its inception from the proposed sale only ranges from 5 percent to 19 percent, and when present activities are added these climb to 8 percent to 33 percent. Such probability figures are high enough to warrant concern.

West Indian (Florida) Manatee - (*Trichechus manatus*)

The manatee is confined to shallow coastal waters, bays, rivers, and inlets along both coasts of Florida, portions of which are designated as Critical Habitat. The probabilities of one or more oilspills of 1000 barrels or more occurring and striking coastal areas within the range of the manatee on the west coast of Florida within 30 days of release is 6 percent. For any one land segment in manatee range, the highest probability, 3 percent, is found adjacent to the Tampa Bay area. On the basis of this information, it would appear that oiling should not pose much of a threat to the manatee.

Boat traffic has been and remains a major threat to the species, and this was the primary topic of concern in the biological opinion of 1979. In this case, the potential hazard from boat traffic would of course derive from any additional boating activities associated with the lease and subsequent exploration for petroleum in the Gulf OCS.

[American crocodile (Crocodylus acutus)

The extension of the OCS lease area south to 25 degrees north latitude offshore Florida increases the potential for disturbance and impact on the crocodile. The lower Keys population within the National Key Deer Refuge would be within 20 nautical miles of the nearest lease tract offered. The nearest documented nesting population to the lease areas is located within Everglades National Park, approximately 30 nautical miles from the nearest lease tract. The oilspill risk analysis shows a 1 percent probability of oil reaching land in land segment 43 within 30 days, but the probability of it reaching Everglades National Park was less than 0.5 percent. Since the possibility of an oilspill is even less during exploration, and no new onshore facilities are anticipated, the April 10, 1979, biological opinion for the American crocodile is still valid. This includes the provision that "any development/production activities in or near the Cape Sable/Florida Bay area will require Section 7 consultation. At that time, further information will be necessary to determine the effect on the American crocodile. This information should include site specific transportation methods to be used, location of all onshore facilities associated with OCS activities, an oilspill trajectory study including current direction/velocity information, and other pertinent information." Although an oilspill risk analysis is now available, there may be a need for more site specific or refined information on oilspill trajectories in case of development/production.]

Conclusion, Advisory Statement, and Cumulative Effects

There are two areas of concern when considering potential affects of leasing and exploring OCS lands in the Gulf of Mexico on Endangered or Threatened species. One is the development of onshore facilities that are either support bases directly associated with exploration activities or marine terminals, refineries, gas processing plants, pipelines, etc. that are associated with subsequent development and production activities. Second is the chance that, if discoveries are sufficient and production occurs, oilspills of significant size may occur and impact listed species and/or their habitats.

In your memorandum of March 11, 1982, you stated that the existing support base at Port Manatee, Florida, is the most likely one to be used, but there is a 5 percent to 10 percent probability that Boca Grande or Key West, Florida, could be used as support bases. We take this to mean that no new support bases will be required for exploration activities resulting from the lease of OCS lands in the Gulf Region covered by this consultation, with the exception of the slight chance that Boca Grande and Key West might be used. Furthemore, it is assumed that all other types of facilities mentioned in this memorandum will be required only if development and production result from exploration in this Region.

It is also understood that the oilspill analysis provided for this consultation pertains only to the development and production phases on lands to be leased in the Region, plus the background of existing production along with the contributory effect of oil imported into the Gulf of Mexico. Therefore, as long as leasing and exploration activities utilize only existing onshore support facilities in the Gulf Region (not to include the use of Boca Grande and Key West, Florida), and as long as the probability of oilspills (of a magnitude large enough to be included in the oilspill analysis) occurring during the exploration phase is essentially zero, then it is my biological opinion that these activities are not likely to jeopardize the continued existence of the bald eagle, the brown pelican, the whooping crane, the loggerhead sea turtle, the Kemp's (=Atlantic) Ridley sea turtle, [the American crocodile,] and the West Indian (Florida) manatee or result in the destruction or adverse modification of the Critical Habitat of the whooping crane, [the American crocodile,] and the Florida manatee. However, should any additional onshore facilities be established along the Gulf Coast in support of exploration activities, particularly south of Tampa Bay, Florida (Port Manatee), then formal Section 7 consultation must be reinitiated. Such a request for consultation must include the following information:

(a) Location of the port to be used for operation;

(b) Routes or channels to be used by the vessels or aircraft and the relationships between these routes and listed species habitat or migration routes;

(c) Description of vessels to be used for support of OCS operations (design, speed, draft, and other pertinent information);

(d) Determinations of whether the vessels used for OCS oil and gas operations would have characteristics which would be more detrimental to manatees than those currently used in manatee habitat.

[(e) Refinement and update of oilspill risk analysis, with emphasis on southwest Florida.]

Even though the probability of one or more oilspills occurring and striking the southwest Florida coast is very small, our concern over the fragile nature of the Florida Bay area expressed in our April 1979 biological opinion continues. In this regard, we reiterate our statement about consulting on the establishment of any support bases along the coast south of Tampa Bay, Florida. We also advise extreme caution when considering any development plans that might feasibly contribute to an increased danger of oilspills in this south Florida area.

We also strongly recommend an investigation into the possible fate of oil from a spill once it is carried out of the Gulf around the southern tip of Florida by the Loop Current. Depending on the location of a spill and the existence and combination of wind and sea currents, it seems possible that oil from the Gulf might end up being deposited on the east coast of Florida under certain conditions.

In this opinion we have endeavored to address the direct (leasing and exploration of OCS lands) and indirect (oilspills and support facilities resulting from exploration) effects of the action as well as the interrelated (development and production phases, along with potential oilspills of the OCS program) and interdependent (pipelines, marine terminals, refinery, gas processing facilities, etc. that could result from development and production) aspects of the action. We have concluded that the direct and indirect actions are not likely to jeopardize the continued existence of the above listed species or result in the destruction or adverse modification of their Critical Habitats if the probability of oilspills from exploration are considered to be near zero and as long as existing support bases are sufficient to handle anticipated exploration activities. Consultation must be reinitiated if indirect actions (especially a need for new support bases) change or, if the interrelated and interdependent activities of development and production commence.

There remains for consideration, the cumulative effects of State and private actions in the Gulf Region that are reasonably certain to occur prior to completion of the Federal action which is the subject of this consultation. Since no specific information on such actions has been provided us by the Federal action agency to date, we reserve the right to make a supplementary comment on the potential effects of these projects (cumulative effects) after receiving a copy of the draft Environmental Impact Statement on this project.

The Minerals Management Service is reminded that Section 7 consultation must be reinitiated if new information reveals impacts on listed species or their habitats from this Federal project that were not considered in this opinion, if the proposed project is subsequently modified, or if a new species is listed or Critical Habitat is designated which may be affected by the proposed actions.

Attachment

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Washington, D.C. 20235

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F/M41:PM

Mr. William D. Bettenberg
Director
Department of the Interior
Minerals Management Service
Reston, Virginia 22091

Dear Mr. Bettenberg:

This is in response to your letter of November 30, 1984, regarding Section 7 consultation for the proposed 1986 Outer Continental Shelf (OCS) lease sale Nos. 104 and 105 in the Gulf of Mexico.

The National Marine Fisheries Service (NMFS) agrees that the proposed lease sales do not present a substantive modification of the proposal considered in our previous consultation on potential effects of OCS leasing and exploration on endangered and threatened species in this region. No significant new information has become available which would alter the conclusions reached in our previous biological opinion (March 29, 1979). Therefore, the NMFS concurs with the Minerals Management Service determination that reinitiation of consultation will not be necessary for the aforementioned lease sales.

The NMFS takes this opportunity to express a continuing concern for the decline of the Kemp's ridley sea turtle population. If new information concerning the numbers of or habitat use by this species becomes available, reinitiation of consultation may become necessary. Since a variety of activities occurring within the Gulf of Mexico have the potential to impact negatively on sea turtle populations, the NMFS is particularly concerned about any cumulative effects that additional projects may present.

If new information becomes available that may change our 1979 biological opinion, the NMFS reserves its right to request a reinitiation of consultation. Questions concerning this matter should be addressed to Ms. Patricia Carter, Office of Protected Species and Habitat Conservation, National Marine Fisheries Service, Washington, D.C. 20235 202/634-7471.

Sincerely,

James E. Douglas, Jr.

William G. Gordon
for Assistant Administrator
for Fisheries

NEW ORLEANS OCS
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ENDANGERED SPECIES ACT

Section 7 Consultation - Threshold Examination

[illegible]es: Bureau of Land Management (BLM) and U.S. Geological Surevey (USGS)

Activity: Gulf of Mexico lease sales, exploration, transportation, termination, development and production.

Consultation Conducted by: National Marine Fisheries Service.

Results of Threshold Examination:

Under Section 7 of the Endangered Species Act of 1973 (the "Act"), as amended, each Federal agency must ensure that any action authorized, funded, or carried out by such agency does not jeopardize an endangered or threatened species. Under the Section 7 consultation process established by the Act, the Secretary of Commerce is required to provide the Federal agency concerned an opinion detailing how the proposed agency action affects any threatened or endangered species within the Department's jurisdiction or the critical habitat of such species. In addition, the Secretary must suggest reasonable and prudent alternatives which would avoid jeopardizing the continued existence of such species or adversely modifying its critical habitat and which can be undertaken by the agency in implementing its action.

By letter of November 28, 1978, the Bureau of Land Management, Department of the Interior, requested initiation of a regional Section 7 consultation with the National Marine Fisheries Service on the Outer Continental Shelf oil and gas leasing program in the Gulf of Mexico.

As part of the consultation process, a meeting was held in New Orleans, Louisiana, on February 9, 1979 with representatives of the Bureau of Land Management, the U.S. Geological Survey, and the National Marine Fisheries Service.

Formal consultation was requested for the following species:

Humpback whale	*Megaptera novaeangliae*
Right whale	*Eubalaena glacialis*
Sei whale	*Balaenoptera borealis*
Blue whale	*Balaenoptera musculus*
Finback whale	*Balaenoptera physalus*
Sperm whale	*Physeter catodon*
Leather back turtle	*Dermochelys coriacea*
Hawksbill turtle	*Eretmochelys imbricata*

Kemp's Ridley turtle	*Lepidochelys kempii*
Green turtle	*Chelonia mydas*
Loggerhead turtle	*Caretta caretta*

Eastern Gulf of Mexico:

These Federal actions involve the offering of 116 tracts for leasing for the extraction of oil and gas. The tracts are located on the Outer Continental Shelf in areas located west, south, and east of that portion of the states of Florida, Alabama, Mississippi, and Louisiana that border on the Gulf of Mexico. The largest portion of the proposed lease offering is located off the coast of Florida.

With two exceptions, each tract contains 5,760 acres (2331.04 hectares). Tract 65-32 contains 5454.72 acres and Tract 65-71 contains 5134.56 acres.

The total area offered in all tracts amounts to 667,229.28 acres (270,023.99 hectares). The tracts are located between 10 statute miles (16 kilometers) to 119 statute miles (190 kilometers) from shore. The water depths range from 60 feet (18 meters) to 1,150 feet (350 meters). Thirty-three of the tracts are located in areas where the water depth is equal to or greater than 200 meters.

Seventy-five of the tracts proposed for offering are believed to have potential for oil and gas production, and the remaining 41 tracts are believed to be potentially oil productive.

No commercial oil and gas production has been found on the Outer Continental Shelf in this region and no marine oil and gas production has been established in this portion of the Gulf of Mexico; therefore, no facilities for the production and transportation of crude and natural gas have been installed on the Outer Continental Shelf in the vicinity of the tracts proposed for leasing.

The U.S. Geological Survey estimates that between 15 and 150 million barrels of oil and 20 - 175 billion cubic feet of natural gas may be produced as a result of this proposed sale. The production rates may be estimated at between 2,500 and 24,000 barrels of oil per day and between 4 and 32 million cubic feet of gas per day. The daily rates are estimated as rates applicable to when development is complete and production stabilizes.

A. Exploration:

Following the awarding of leases, the successful bidders can be expected to drill exploratory wells in order to locate and delineate the areal extent of oil and gas deposits. The most likely number of exploratory wells to be drilled would be 75. These wells will probably be drilled by moveable offshore drilling units.

B. Development and Production:

After the completion of exploratory drilling, platforms would be designed, constructed, and placed in position. Development wells will be drilled from platforms. The most likely number of platforms to be installed is 25, and the most likely number of development wells is 225. Underwater completions may also be utilized. Support facilities for this activity could be located in the Tampa, Panama City, or Mobile areas. The expected production life is 25 years.

C. Transportation:

The most likely method of transportation that will result from the proposed sale will be pipeline transportation of natural gas to shore points in the vicinity of existing onshore natural gas pipelines.

The most likely system for the transport of crude oil would be pipeline transport to onshore storage facilities and transportation from these terminals to existing refineries by surface marine transport. The most likely pipeline mileage that may be installed is 700 miles. Probable destination points and locations of oil terminal facilities and gas processing plants are the Manatee/Tampa area and the Mobile/Pensacola area.

A possible alternative gathering and transportation system could include the provision of offshore storage on the OCS and direct transportation from these facilities to existing refineries.

D. Termination:

Title 43, 3307.3-4 and 3307.3-6 provide for the removal of all structures when no longer required for operations. The removal must be completed within a period of one year following the expiration of the lease, and the structures must be removed to a sufficient depth beneath the surface of the waters to prevent them from being a hazard to navigation and the fishing industry.

OCS Order No. 3 requires that all casing and piling shall be severed and removed to at least 15 feet below the Gulf floor and the location shall be dragged to clear the well site of any obstructions.

This proposed action must be viewed as one part of a continuing activity that has been underway since the 1940's. Although primary emphasis has been placed on this particular sale, it should be put into the perspective of an on-going offshore oil and gas development process. As of June 23, 1977, there have been 34 OCS oil and gas (and five OCS sulfur and salt) lease sales on submerged lands in Federal areas of the Gulf of Mexico.

Currently, the Bureau of Land Management holds 495 permits on the OCS resulting in 5,862 miles of offshore pipelines. These figures are as of October 31, 1977, and exclude 12 pending applications.

As production declines in existing areas, much of the equipment, transportation facilities, and personnel can be used for new areas of activity. As existing areas of production decline, the pipelines in place can be used for new production areas, adjacent or further from shore, reducing the number of pipelines necessary to transport production from new areas to shore. This latter event has already been exercised in some areas of offshore Louisiana. Likewise, a reduction in quantity of onshore facilities, such as treatment plants, refineries, storage facilities, etc., is made possible by utilizing existing facilities, equipment, and technology.

Proposed OCS planning schedules are developed in order to project the timing, size, and location of specific sales for an OCS leasing program. The goal of the proposed schedule is to provide for orderly development of OCS oil and gas in order to maintain an adequate contribution of OCS production to the national supply and to provide early information concerning areas proposed for leasing activities.

Western and Central Gulf of Mexico:

These proposed lease sales would provide for the orderly and timely development of oil and gas reserves expected to occur on 115 tracts on the Outer Continental Shelf (OCS) in Federal waters in the Gulf of Mexico offshore of Texas, Louisiana, Mississippi and Alabama.

These tracts include approximately 545,255.24 acres and range from 3 to 165 nautical miles (6-189 kilometers) from shore in water depths of 6 to 500 meters. Approximately fifty-eight percent of these tracts are gas prone, four percent are oil prone, and thirty-eight percent are both oil and gas prone.

Surveys indicating seismic refraction, seismic reflection, gravity, magnetics, bright spot technology, and stratigraphic correlation are collected before and after leasing to assist in the determination, location, and magnitude of petroleum resources. Surface vessels of the 50 to 300 ton class are utilized to perform geophysical surveys. In general, seismic surveys record the behavior of shock waves through various rock formations. This information is used to determine the presence of salt domes, folds, faults and sediment thickness.

A. Exploration:

After a lease has been issued, shallow surveys defining geologic hazards, bottom stability, cultural resources and other conditions which might affect exploratory drill site locations are performed. Once a location has been selected, exploratory drilling begins. These drilling operations are basically the same regardless of the type of mobile rig utilized (jack-up rigs, drillships or semi-submersibles). Initially, a drive pipe is installed along with a blowout preventer. The actual drilling process involves the use of introduced muds which acts as lubricants, coolants, and pressure controls. Cuttings or a mixture of mud and drilled materials are a product of the drilling process. Sixty to 160 exploratory wells may be drilled as a result of this action.

B. Development and Production:

When petroleum discoveries are made and the extent of a field has been determined, a plan of development is devised. As a result, 10 to 25 multi-well platforms may be established with the drilling of 60 to 150 production wells.

The production phase of OCS oil and gas operations consists of bringing the product to the surface and preparing it for transport. This phase of the operation may go on for as long as 20 years. Formation waters of reservoir brines are produced in the oil and gas production process.

C. Transportation:

The principal means of getting gas and oil resources in the Gulf of Mexico from production areas offshore to processing and storage locations onshore has been and will continue to be via pipelines. Additionally, the labor force, equipment and supplies needed to service the various stages of offshore operations are transported by crewboats, barges and helicopters. As a result of this proposed action, 100 to 200 miles of new pipeline may be laid. These lines would run from new production facilities offshore and connect with the existing pipeline system to onshore facilities. It is anticipated that no new pipelines to facilities onshore will be required.

D. Termination:

When a reservoir has been depleted to a level at which it cannot produce profitably, operations are terminated. According to industry estimates, with proper placement of wells and sufficient pipeline capacity, a gas reservoir could be drained in as little as 10 years. In contrast, some oil reservoirs have been producing for over 20 years.

OCS orders issued by the U.S. Geological Survey require wells to be plugged, the casing severed adequately below the mudline, the platform removed, and all obstructions cleared from the area. Major trunklines may be used for future production from adjacent areas, but smaller lines would probably be abandoned in place. Abandonment of pipelines consists of flushing the lines of entrained hydrocarbons by water, disposing of the water onshore, and severing the ends below the mudline.

Endangered Species Impacts

Whales:

The posible impacts on whales and their critical habitat from exploratory and development/production activities were given thorough consideration. These included the following:

1. Seismic - It is the opinion of the Consultation Team that no unfavorable impacts would result from seismic operations.

2. Oil Spills - Conceivably, a large oil spill occurring in the immediate vicinity of whales could be harmful because of the possible intake of oil through the blow hole, fouling of the baleen plates, and indirectly from the ingestion of oil contaminated food. However, endangered cetaceans are uncommon in the lease/sale area and are sighted only on rare occasions. Therefore, even if an oil spill occurred in the tract areas, it is unlikely that any endangerd whales will be affected. In addition, there is no historical record of such an occurrence.

3. Boat traffic - Due to the migratory nature of whales, the small increase in boat traffic would have a minimal (non-measurable) impact.

Turtles:

The following exploratory and production/development activities were reviewed to determine possible impacts on sea turtles and their critical habitat:

1. Seismic - None.

2. Oil spills - The effect of oil spills is not known. However, oil ingestion or physical contact by turtles, especially with the eyes and nostrils and particularly in hatchlings entrapped in a spill, could be lethal. Hatchling and juvenile turtles are believed to be passively distributed by surface currents, the same mechanism that spreads oil. None of the five species of sea turtles that are found in the Gulf of Mexico occur in concentrated numbers of assemblages in those waters, and oil spills in limited areas would not be expected to impact on more than a few individuals at sea. Oil spills, however, could have severe impacts on nesting beaches if washed ashore at nesting seasons. Therefore, every effort to minimize the potential for spills should be exercised.

3. Boat traffic - As with whales, the small increase in boat traffic would have a minimal impact on sea turtles.

4. Drilling - Platforms and pipelines may increase habitat by creating "live-bottom" topography. Turtles have been observed to feed on sessile organisms attached to platforms. During the period from mid-

summer to mid-fall, lights on drilling platforms near shore could attract hatchling turtles resulting in abnormal concentrations. These disoriented turtles would possibly be subjected to increased predation. It is recommended that monitoring of the effect of lights, particularly on hatchling loggerheads, be conducted to determine the significance of their impact.

Biological Determination and Need for Additional Information or Further Consultation:

After a careful review of the findings by the Consultation Team, it is my biological opinion that the proposed project is not likely to jeopardize the continued existence of the endangered or threatened species listed above or result in the destruction or adverse modification of habitats determined to be critical to them. This biological opinion is based on the general information in the EIS concerning possible effects of the proposed actions and does not relieve BLM or USGS of the continuing responsibility of reviewing their activities and programs in light of their Section 7 consultation should new information reveal impacts of the identified activities that may affect listed species or their habitats, or these activities are subsequently modified, or a new species is listed that may be affected.

Appendix D

Use of Dispersants on Oil Spills

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Recent attention has been given to the use of chemical dispersants for oil spill cleanup in the Gulf of Mexico. The State of Florida signed a letter of agreement authorizing the use of dispersants in September 1984. Serious consideration is now being given to a similar agreement for the State of Texas as a result of the Alvenus oil spill in August 1984. Also, the use of dispersants is being considered by the State of Louisiana. This preliminary report contains a discussion of what dispersants are and how they; work, when and how to use them, and a historical perspective of concepts of dispersants.

The key components of chemical dispersants are surface active agents (surfactants) which are molecules that have both water-soluble (hydrophilic) and oil-soluble (hydrophobic) ends. These molecules, when applied to an oil spill, orient themselves at the water/oil interface such that the hydrophilic ends of the molecules are in the water and the hydrophobic ends are in the oil. The result is a reduction of interfacial tension between the oil and water. This action reduces the cohesiveness of the oil slick and, with agitation, forms finely dispersed oil droplets (ranging in size, depending on the effectiveness of the surfactant formulation, from about 10 microns to 0.5 mm in diameter) in the near-surface water. (The hydrophilic surfactant groups prevent droplet recoalescence.)

The use of chemical dispersants is one of the options available for oil spill cleanup; others include booms, skimmers, sorbents, and pumps. The choice of method will depend on considerations of safety, environmental damage potential, equipment supply and availability, cost, and weather conditions. Taking no action and allowing for natural removal may be an option in cases where the slick is moving out to sea and is not expected to contact the shoreline.

The decision to use dispersants should be made as soon as possible after the spill incident. Weathering of oil will increase the viscosity and decrease the capability of chemically dispersing the oil. Factors to be considered in making this decision are oil type and properties, environmental conditions, the availability of dispersant and application equipment, and the probable fate of the oil without treatment. Highly viscous oils (greater than 5,000 centistokes), oils with pour points near or above ambient temperature, and oils with a high wax or asphaltene content may not be amenable to dispersant treatment (International Tanker Owners Pollution Federation, Ltd., 1982; Canevari, Oil Spill Conference, 1985). Dispersants are not recommended for use on spills on very calm waters. Some dispersants are formulated for use on marine (salt water) spills only.

Dispersants may be applied by boat or aircraft. However, both require spotter aircraft to direct operations. Boat application is limited to small spills or those within a few miles of shore. Aerial spraying is the preferred method. It offers rapid response, coverage of large areas per unit of time, good control of treamtent rates, optimum use of dispersants, and much better evaluation of treatment results than is possible from boats. A portable system designed for the Hercules C-130 airplane appears to be the most efficient, although various aircraft (including helicopters) may be used if properly equipped. Regardless of the method used, the application system must deliver the proper dosage of dispersant in a uniform spray of droplets to the slick. Most oil slicks considered for dispersion will be 0.25 mm thick, or less. A 0.25 mm thick slick contains over 4,000 bbls per square mile of oil. The dispersant must penetrate the oil to reach the oil/water interface. The proper dosage of dispersant (5 gal/acre is an average amount, depending on the dispersant and the oil type) must be used to attain the maximum reduction of interfacial tension. Finally, some form of energy, e.g., wind, wave, or mechanical, must be applied to the oil/water interface to cause the dispersion of oil into the upper part of the water column. Newer types of dispersants require very little mixing energy.

In the United States, dispersants have been used both on actual spills and in research oil spill tests. Dispersants were used in February 1970 on Chevron's Main Pass Platform Charlie blowout in the Gulf of Mexico; in July 1978 on a fuel oil spill from a barge near Rockaway Point, New York; and in November 1984 on the T/V Puerto Rican spill near San Francisco, California; and in February 1985 on Amoco's West Delta Block 75 blowout in the Gulf of Mexico. Research spills, which have provided much detailed information about dispersed oil, include those off the east coast of the United States in 1978 and 1979; off the coast of Southern California in 1979; at Searsport, Maine, in 1980; and in a Louisiana salt marsh in 1982.

Table D-1 contains a historical perspective of initial and recent erroneous concepts regarding dispersants, and other scoping information.

Table D-1

Historical Perspective of Concepts of Dispersants

Initial Concepts

- Dispersants are highly toxic.
- Dispersants are ineffective.

Recent Erroneous Concepts

- Dispersants should be used only as a last resort.
- Dispersants can be sprayed on water.
- Dispersed oil sinks and adheres to fish, birds, mammals, and sediments.
- High concentrations of dispersants occur where they have been applied.
- Dispersants have not been used in the United States.
- Agency approval for use of dispersants is difficult to obtain.
- There is a paucity of research on dispersants and their toxicity.

Scoping Information

- Subpart H of the National Contingency Plan authorizes the On-Scene Coordinator, in consultation with the Regional Response Team (RRT), to grant approval for dispersant use when necessary due to danger to personnel, when recommended by the RRT, or requested by the spiller.
- The State of Florida has developed a letter of agreement allowing the On-Scene Coordinator to use dispersants without concurrence of the State and USEPA.
- The Texas Governor's Advisory Panel on Offshore Oil and Chemical Spill Responses has recommended that Texas develop a letter of understanding similar to that of Florida.
- The State of Louisiana is considering developing a similar plan.
- There exists an American Petroleum Institute (API) Ad Hoc Dispersants Task Force.
- The API Task Force has given several dispersant information seminars.
- Exxon Chemical Company has presented 20 Oil Spill Chemical Technical Seminars worldwide for government and industry, including 7 in the United States.
- The third- and fourth-generation dispersants used now are more effective and less toxic.
- Dispersants should be used where mechanical recovery is not feasible, and the decision to use chemicals should be made as soon as possible rather than as a last resort action. Preplanning is encouraged to expedite the decision process.
- Dispersants are effective on obviously spreading oils, often including those with viscosities of up to 5,000 centistokes, but not on extremely viscous crudes or fuels, those with high residual content, or those on waters of a temperature below the oil's pour point.
- Dispersants must be properly applied on the oil slick.
- Dispersants should not be used on bird or marine mammal habitat.
- Dispersed oil does not sink and does not adhere to birds, mammals, fish, and sediments.
- Dosages required result in low concentrations of dispersants in the water.
- Most dispersants are not highly toxic; however, toxic and improperly applied dispersants have been and are used in foreign countries in some instances.
- Dispersants have been used successfully in the United States.
- Little research on dispersants has been conducted by Federal regulatory agencies such as USEPA.
- API, a number of oil companies, and the American Society for Testing and Materials are presently leading in the research on the operational use and environmental impacts associated with the use of dispersants.

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Appendix E

Description of Resource Assessment Methodology

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The analyses in the EIS, SID, and other related documents are based on MMS estimates of the quantities of undiscovered economically recoverable hydrocarbon resources that may exist in the areas considered for lease. There is considerable uncertainty concerning the quantities of oil and gas that may be present; indeed, in some areas, it is probable that the entire planning area is devoid of hydrocarbons. Because the potential environmental impacts resulting from a lease sale in a barren area are minimal, the impact analysis is based on conditional resource estimates; i.e., the estimate of quantities of oil and gas resources that may be found and developed, given that there are economically recoverable accumulations of hydrocarbons present. Because of the uncertainties surrounding potential volumes of hydrocarbon present in prospects and as to which prospects and/or combination of prospects may contain hydrocarbons, the conditional resource estimates are developed using probabilistic techniques and are reported as probability distributions rather than as point estimates.

The procedures used to develop these probabilistic resource estimates are incorporated in a computer model named PRESTO, an acronym for "probabilistic resource estimates - OCS." The PRESTO methodology is designed to utilize the type and amount of data typically available to MMS. The data available for this assessment were generally adequate to identify potential prospects and to determine their approximate size. It was, however, necessary in some instances to include hypothetical prospects based on extrapolations of known trends and appropriate geologic analogs. This was necessary because some areas lacked sufficient data to adequately identify individual prospects. It was, therefore, possible to analyze the resource potential of the area on a prospect-by-prospect basis. In some areas, sufficient stratigraphic data may exist to identify different potential hydrocarbon pay zones (horizons) with the prospects. It is possible in these areas to analyze the resource potential on a horizon-by-horizon basis, as well as a prospect-by-prospect basis. Therefore, the PRESTO methodology is designed to accommodate an analysis of hydrocarbon resource potential for an area on a horizon-by-horizon and a prospect-by-prospect basis.

A volumetric method is employed for the analysis of the resource potential of individual prospective zones. Seven variables are considered in determining potential hydrocarbon volumes: (1) productive area (acres); (2) pay thickness (feet); (3) proportion of pay in oil reservoirs; (4) oil recovery factor for oil reservoirs (barrels per acre-foot); (5) gas-oil ratio (cubic feet of associated gas per barrel); (6) gas recovery factor for gas reservoirs (thousands of cubic feet of nonassociated gas per acre-foot); and (7) condensate yield ratio for liquids produced from gas reservoirs (barrels per million cubic feet of nonassociated gas). Either single point values for each of these variables or parameters describing a probability distribution may be used.

In addition to the reservoir parameters, several other inputs are required. For each zone in each prospect, a zone geologic risk factor must be estimated. This risk factor represents the overall probability that the zone in the prospect under consideration will be dry. For each prospect, two additional input values are required: a "minimal economic field size" for the prospect and a prospect geologic risk factor. The minimum economic field sizes are developed using a discounted cash flow analysis program. This value represents the minimum quantity of oil and gas that must be present to be considered economically producible given current and expected future cost/price relationships and technological trends. The minimum economic field size allows for variations in costs associated with the exploration and development of prospects in differing cost regimes, such as deepwater vs. shallow water.

The prospect risk factor reflects an assessment of the probability that the prospect as modeled would be barren of hydrocarbons, without including additional considerations unique to individual zones. In addition to the zone and prospect geologic risk factors, a risk factor which applies to the area under consideration as a whole is required. This area risk factor reflects an assessment of the probability that no prospect as modeled will contain hydrocarbons.

The prospect risk factor controls the degree of statistical dependence for discovery among the individual zones. A high value indicates a high degree of dependence, which implies that a discovery in one zone greatly increases the chance for success in other zones. Conversely, a low value implies that the risks associated with individual zones are unrelated; i.e., a discovery in one zone has little effect on the chances for discovery in other zones. The area risk factor works in the same manner; however, it controls the dependency for discoveries among the individual prospects rather than individual zones.

Monte Carlo or range-of-values simulation techniques are used to develop a conditional probability distribution for the area as a whole. This technique explicitly recognizes the probabilistic nature of the variables affecting the resource assessment and calculates a large number of possible outcomes, based upon random samples from the input probability distribution. Providing a single number for the resource estimates for an area is misleading, since it provides no insight as to the relative uncertainty involved. The Monte Carlo technique provides a range of resource estimates for the area with the probability of each value occurring, being a direct consequence of the uncertainty in the geological and engineering data (e.g., areal extent and thickness of the hydrocarbon pay zone, recovery factors, and which prospects and/or combination of prospects will contain hydrocarbons). Specific oil and gas amounts corresponding to the mean value, 5th percentile and 95th percentile values of the distribution for barrel equivalent of total resources are reported. Also reported is the probability that no economically recoverable resources exist in the area under consideration.

Appendix F

Final Sale Notice-Sale 98

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INFORMATION FROM THE SALE NOTICE FOR OIL AND GAS LEASE SALE 98 INCLUDING THE BOUNDARY DEFERRAL OFFSHORE MISSISSIPPI AND ALABAMA, AND THE 2,400 METER DEFFRRAL

	Blocks	Acres
Blocks and Acres in Planning Area*	8,579	45,061,436.83
Blocks Leased	2,428 (Whole) 82 (Portion)	12,001,010.60
Less 2,400 Meter Deferral	1,584	9,054,269.32
Available for leasing	4,567 blocks	24,006,156.91

*Does not include approximately 15 blocks deferred for final determination of the State/Federal boundary offshore Mississippi and Alabama.

Mississippi/Alabama enclave acreage figures are not included as a result of the ruling by the U.S. Supreme Court on February 26, 1985 that the enclave areas belong to the States.

Stipulation No. 5: 8-Year Lease Term

For each oil and gas lease in the 400-meter to 900-meter water-depth range, the lessee must commence the drilling of an exploratory well within 5 years of the date the lease becomes effective. The exploratory well shall meet the depth and other criteria established in an approved exploration plan.

For additional information pertaining to Lease Sale 98, see the complete MMS Final Notice of Sale for the Outer Continental Shelf Central Gulf of Mexico Oil and Gas Lease Sale 98.

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SECTION X

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March 3, 1849

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interest of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

DEPARTMENT OF THE INTERIOR
MINERALS MANAGEMENT SERVICE

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